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THE ADJUSTMENT OF AGRICULTURAL PRODUCTION TO DEMAND ¹

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In considering the adjustment of production to demand one may approach the problem either from the point of view of the producing group as a whole or from the point of view of the individual producer.² Adjustment by the group as a whole implies adjustment of mass production to demand changes alone. Adjustment by the individual requires in addition a consideration of what mass action may be taken by his fellow producers, for this mass action through its influence on supplies is in itself an important factor in causing price changes. It is the intention to discuss the subject first from the point of view of the group as a whole and then to take up the considerations involved in individual adjustments.

The problem of the adjustment of agricultural production to demand is continually brought before the student of agricultural problems by the ever-present cases of temporary maladjustment. Of course, in the long run agricultural production is brought into approximate adjustment by the supply-cost and the supply-price relationships. Changes of shorter duration, however, do not exhibit this adjustment.

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 29, 1925.

² The subject of the adjustment of agricultural production to demand could not be adequately treated in several volumes, let alone one short paper. In order to carry through the central theme, therefore, it has been necessary to omit much qualifying and corollary material. Controversial phases have also had to be treated in a somewhat didactic manner.

The hog price cycle taken in conjunction with the hog production cycle is a familiar example of almost continuous, short-time maladjustment. The cycle is induced by the conscious attempts of producers to make adjustments to price. But these adjustments so overshoot the mark that the industry might be better off without them. The adjustments follow a fairly well-defined cycle. Under the stimulus of high prices, producers initiate increased production, but the increase is so great that when the hogs come to market some eighteen or more months later, the increased supply depresses the prices. The depressed prices then cause producers to over-restrict production. The effect of this restriction is in turn to increase prices when the reduced production is marketed and the cycle then repeats itself. In a sense the producer is his own nemesis.

The hog industry is by no means an isolated instance of such maladjustment. The same phenomenon may be observed in the cash crops, although here the producers' attempted adjustments, which would often over-shoot the mark if accomplished, are frequently partially thwarted by variations in yields over which the weather has more control than the producer. The tendency to "over-adjust" in the case of crops is best observed by comparing changes in prices with changes in acreage later ensuing rather than changes in prices with changes in production, for changes in production are also caused by changes in yields per acre. Taking cotton as an example, the influence of price on subsequent acreage shows a striking consistency. This may be observed in the figure on p. 147, in which cotton price and acreage are graphed.

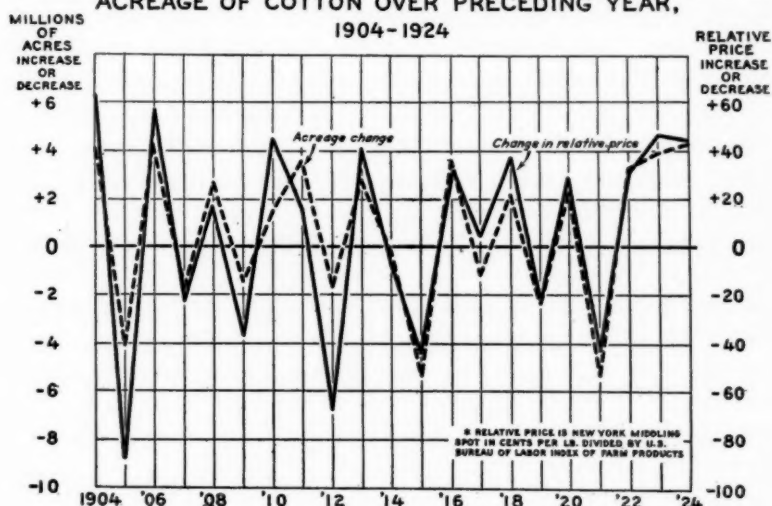
In this graph there are two curves. One curve is constructed from relative cotton prices in January ³, the other curve from the United States acreages of cotton harvested the next fall. Both curves are constructed to show the changes taking place from the preceding year. When both curves are above the zero change line it means that price and subsequent acreage have increased, when below they have decreased. The outstanding feature of this graph is the close relation exhibited

³ Average of the daily closing prices (cents per pound) for middling spot cotton in New York during January divided by the Bureau of Labor index for farm products and multiplied by 1,000. First differences in the series so obtained are graphed.

between the price of cotton and subsequent acreage, showing that high prices induce expansion; low prices, restriction. The correlation between the two is 0.94.

The graph, however, illustrates not only the tendency of acreage to follow price but also that sufficient acreage adjustment was usually made each year to change profitable growing to unprofitable or, vice versa, unprofitable to profitable. Nearly all years of acreage increases are followed by years of decreases and nearly all years of decreases are in turn

CHANGE IN JANUARY RELATIVE PRICE OF COTTON* AND IN U.S. ACREAGE OF COTTON OVER PRECEDING YEAR, 1904-1924



followed by increases, showing that over-adjustments were made and that attempted readjustments in the following years were in turn overdone.

The close relation of cotton acreage changes to price changes would not be unfortunate were the price changes an indication of subsequent demand conditions rather than a reflection of current supply conditions. An increased demand would increase price and the increasing of acreage in anticipation thereof is, in such a case, a legitimate adjustment. But an increased price may also be due to reduced production following poor yields. The subsequent expansion of acreage in response to this current situation is often an illegitimate adjustment and is quite apt to result in an unprofitable year. For

if acreage be increased, the total expenses of production, which (with the exception of harvesting costs) tend to parallel acreage, would be increased. On the other hand, no matter what the production resulting might be, total value and hence total receipts for the crop would change but little unless there were changes in demand. If the production were greater, the price would be less in somewhat the same proportion, and conversely poor yields, though increasing price per unit through reduced supplies, would be offset by the fact that there would be less to sell in somewhat the same proportion. Adjustment to prospective demand changes is generally sound policy almost irrespective of prices at the time the adjustment is initiated. Adjustment to those current price conditions which are consequent upon supply changes tends to be a self-perpetuating pendulum process of continuous maladjustment.

In this pendulum process there is first a high price, then acreage expands and the crop is increased, producing competition of producers in selling which forces the price down when the crop is marketed. Heavy carryovers keep the price down though not stimulating consumption sufficiently to insure the stocks being used up. The consequent low prices cause restriction in acreage which later reduces crops and thus again increases prices, whereupon the process is again repeated.

The cycles are of two kinds—yearly and of longer periods. The presence of the annual swings is illustrated in the graph of cotton acreage and prices cited previously. As was pointed out, each year of acreage increase was followed by a decrease and each decrease followed by an increase with but few exceptions. Pendulum-like swings of longer duration are initiated sometimes by major changes in demand such as those caused by the war. The opening of the war was concurrent with a record production of cotton. This was unfortunate, for the falling off of foreign demand in conjunction with the large crops built up unheralded stocks of cotton. As complete a cessation of cotton production as possible within the limits open to producers was then in order. Every possible restriction of expenses in cotton production should have been enforced. As it was, it took nearly seven years to get the production down to a point where it would again be fairly profit-

able; seven years, and the boll weevil rather than the producer was to be thanked for that. And of course the adjustment, through its failure to be prompt, paid for that failure by later overshooting the mark. When the excess stocks were finally eaten away and the full force of an improved demand was again directed towards the producers it found the production facilities quite inadequate. The price therefore went up as high as 40 cents, whereupon the producers set determinedly to work to reduce this price by expanding and expanding production. We have now had four successive years of pronounced acreage expansion, a situation which has not had its equal in the last half century. It is quite likely that the mark will again be overshot.

I have used cotton in the preceding illustration because it is the crop with which I am most familiar. But Mr. Dagget, of the Bureau of Agricultural Economics, informs me that he has been able to trace close relationships between acreage of wheat and price during planting time, taking into account the degree to which the weather at planting time interferes with the carrying out of the intention and the yields per acre of the past season. The correlation is greater than 0.90. There is also a very close relation between supplies of wheat and price. The existence of the same circle of influences in the case of cotton is thus established.

The tree crops offer an example of much longer cycles, since it takes longer to bring an orchard into bearing. The cycles also have a more sedate swing owing to the greater capital and persistence necessary to enter into the production. This, in combination with the determined efforts to expand markets made by the cooperative association, has made possible the marked expansion of the citrus industry. Otherwise glutting of the market would have checked the expansion as actually did occur in the case of California raisins. It is perhaps fortunate for the citrus industry that infant orchards in Florida are being made over into winter resorts.

A study made by Mr. Sarle, of the Bureau of Agricultural Economics, points to a much restricted production of horses, which might result in a shortage which would elevate prices in a few years to a point where producers would regret their present restriction. Mr. Sarle points out, however, that more

adequate measurements of the substitution of mechanical power and its relative costs than now available must be made before definite statement as to the duration and amplitude of the cycle can be made. Not beyond the memory of cattle producers is the period of severe depression they were forced to go through owing to overproduction. Prices are not so bad for them now. But how long will it be before the prosperous condition will induce expansion to a detrimental point? The sheep-raising industry is probably on the crest of a cycle.

Attempts to check over-production when it comes in view practically always meet with pronounced unsucccess for the reason that the individual interest of each producer is diametrically opposed to the interest of the group as a whole in the execution of such a program. When most producers intend to reduce acreage, then is the time for the individual producer to make a big crop and take advantage of the higher prices. Each individual accordingly proceeds to gratify his own interest, forgetting that every other individual is probably doing the same thing, with the net result they all suffer together. The difficulty is not that the individuals are motivated by self-interest but that under present systems such motivation fails to be effective. If it were, they would profit.

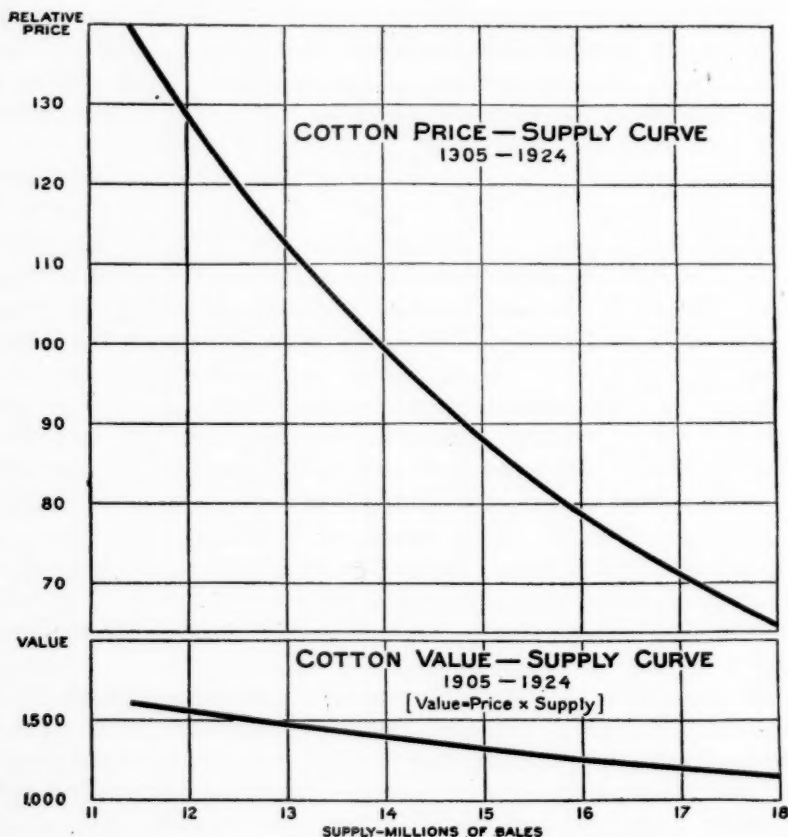
For example, it is perhaps a fact that every cotton producer in the South today would be better off if they had all plowed under ten per cent of their this year's crop prior to picking. The total amount they would have received for what remained would have been in excess of what they received for the larger quantity, though but slightly. This can be said from a study made of the relation of price and supply over a period of years. This study shows that although for small changes there exists practically a reciprocal relation between price and supply, for more general changes a decrease in supply is more than offset by the resulting increase in price. Short crops represent a greater value than long. This, after all, is but logical, for a certain proportion of cotton consumed represents an inelastic demand. This portion is the portion which goes into manufacture of other goods as a necessary but minor material which will be purchased regardless of the price. The reducing of supplies permits this inelastic consumption to represent a greater proportion of the total consumption and

hence increases the price in a somewhat greater proportion. This generalization, of course, is true only for the range of supply embraced by the study. It would be absurd to say that if only one bale of cotton were grown it would be worth a billion and a half dollars.

For the interest of statisticians the technical aspects of this study might be briefly detailed. The price of cotton was correlated with two other variables—the general price level and the supply of cotton for a twenty-year period, 1905 to 1924 inclusive. [The price was the average spot price in cents per pound at New Orleans during December. The price level was measured by the December all commodity index of the Bureau of Labor.] The supply was taken as the carry-over plus the production in millions of bales. The logarithms rather than the original variables were correlated, since changes may logically be supposed to be of a proportional rather than linear nature. The multiple correlation of price with the other two variables was 0.955. The regression equation was: $\text{Price} = 0.889 \times \text{Price Level}^{-1.548} \times \text{Supply}^{-1.705}$. The curve representing the net relation between supply and price showed greater total values for small crops than large. The price curve and the total value curve derived from it are shown in the figure on page 152. The price scale is not in terms of currency but in terms of currency with the net influence of the general price level eliminated, i. e., a relative price. Similarly the value scale is the product of the supply in terms of million bales times the associated relative price.

Returning now to the statement that producers would have received a slightly greater sum for a ten per cent smaller crop of cotton this season, this is not the most significant way in which they would have benefited. The sum expended for picking would be more than ten per cent less and picking is one of the most important expense items in production. This item would be more than ten per cent less because not only would there be ten per cent less cotton to pick but the cost per unit would be reduced. In times of large crops, costs per unit of picking are sometimes double those in times of small crops, owing to the competition for pickers among producers.

In yet other ways the producers would reduce total expenses while increasing total returns; total ginning, freight, handling, and in some instances selling costs would be reduced. And finally the grade of the crop might have been materially improved both by using discrimination in selecting the ten per cent to have been plowed under and by prompt picking made



possible through reduced competition for pickers. Even after the crop was picked, it would probably have been more profitable to the producers to have destroyed ten per cent. The next "buy a bale" movement instituted would be more promptly effective in achieving its object were it converted to a "burn a bale" movement.

Such a program of crop destruction, however, is practically a psychological impossibility in the present social order. The international protest on the part of consumers would probably be most disconcerting. Furthermore, to compel a producer to destroy the crop he has labored to produce would require almost tyrannical measures. Nor, after all, is such a program necessary or desirable if less drastic methods of controlling supply were used. The same result, for example, might have been attained by *not increasing* acreage this past season. In fact this course would have been even more profitable, since earlier expenses of planting and cultivating would have been avoided.

The discussion heretofore has presupposed the desirability of levelling out the peaks and hollows in production or at least making them conform to changes in demand. An examination of this assumption, however, reveals more theories than facts. Nevertheless the history of three hog producers cited in a bulletin ⁴ of the Department of Agriculture shortly to be issued, may be briefly stated. One of these producers started to expand his production when prices were high and to reduce his production when prices were low—in short did just as most producers did. His average annual labor income was about \$60. Another of these producers did not change the extent of his operations, but year in and year out marketed the same number of hogs. His average annual labor income was approximately \$1,380. The third of these producers did the opposite from the first, expanding his production when low prices made others reduce theirs and reducing his production when high prices stimulated others to expand theirs. His average annual labor income was approximately \$1,620.

This, of course, is far too meager data from which to draw generalizations, but it nevertheless illustrates what might well be the case. A continuous process of almost any nature, whether it be agricultural, mechanical, commercial, or financial, can generally be made more efficient than a seriously fluctuating process. One of the hog producers cited above had a constant production yet made profits but little less than those of the man who expanded his production to meet high prices. The man representing most of the producers made

⁴ *Factors Affecting the Price of Hogs.* Hans and Ezekiel.

comparatively nothing. Smoothing out production might well mean lower unit costs throughout the industry. In any event there is little question but that the adjusting of production to demand changes would be beneficial, could such changes be anticipated. In the event of decreasing demand conditions it would benefit the producer to reduce his production program and his total expenses so that some profit might be retained. In the event of increasing demand, expansion is obviously legitimate and this is the only time when it is legitimate excepting when the introduction of new methods puts the industry on a lower cost basis. The cotton gin illustrates such a change in method.

Although the smoothing out of those supply cycles which are not in agreement with demand changes is in itself a desirable goal to attain, a comprehensive treatment of this adjustment problem requires a broader point of view taking into account also the economic relation between agricultural and non-agricultural production.

The social order as a whole is engaged in the production of goods, and services, the total application of all producing a total amount which renders satisfaction or enjoyment. There must be some distribution or apportionment of available resources to the production of various goods or services which will result in a greater total satisfaction than any other apportionment, the apportionment taking into account both the economic effort necessary to produce the various goods and the satisfaction derived from them. The mechanism through which this distribution is effected is the price structure of the country; through it relative satisfaction (weighted by purchasing power) is measured and production is controlled. If too great a proportion of the total effort is launched in the production of one class of goods, the balance is upset and total satisfaction is reduced. The extra energy expended in the effort would have resulted in a greater sum of satisfaction if applied differently.

Although the equilibrium is probably never long maintained, such an unbalancing of it is most apt to occur in the production of goods of which people want a certain definite amount, no more and no less, failing to derive much satisfaction for

more and severely feeling restriction. Of all the major types of goods, foodstuffs best classify in this group. They administer to highly satiable, though recurring, wants, and yet they are necessities. There is not only a certain semi-rigid quantity of foodstuffs which is desired, but variations from this quantity are also more apt to occur than in the production of nearly any other type of goods, owing to the uncontrollable influence of the weather upon yields per acre. The fact that agricultural production once initiated runs its course without much control of man is also important in this connection. Furthermore the sub-marginal producers have greater ability to survive than in most other industries.

A complete solution of the adjustment problem requires a precise determination of the apportionment of productive effort to agricultural production which will result in the greatest sum total of satisfaction. It requires furthermore that, once this is determined, some mechanism of attaining this adjustment be developed. The price structure as it now exists is an insufficient mechanism owing to the lag between price incidence and price effect upon agricultural production. If the lag could be eliminated the present mechanism would be more effective.

A disturbance of the equilibrium in production of economic goods, likely to occur in agricultural production, is damaging to the well-being of both the producing group and all other groups, for it, like other disturbances, can only mean a reduction in the sum total of satisfaction. Effort expended in producing food products beyond what consumers desire would be better directed to the production of other satisfactions the wants for which are less easily satiated. But since the producer cannot directly exert his effort in this manner, he should do it indirectly. Instead of expending his surplus resources and income to buy high-priced land and produce more food which society does not want, he should spend them in purchasing other utilities for himself, thus encouraging the production of those goods which society does want. This will not only raise his standard of living but, by avoiding overproduction and excessive expenses, it will assure to him a more certain income in the future years; and finally it will

divert the producers' surplus income from the production of foodstuffs beyond where they are wanted to the production of goods which are wanted. It will support the other consumers in their production of these goods rather than compel them, though indirectly, to share in the costs of producing foodstuffs to a point beyond where the total satisfaction in them justifies the effort. It is thus that proper adjustment of agricultural production is of importance to other economic production and hence becomes a general problem.

But before any adjustment program, no matter what it is, can be set in operation there must be an effective mechanism for carrying it out. Existing types of organization are quite inadequate to such a purpose. A cooperative association or chain of cooperatives which falls much short of 100 per cent membership of producers breeds its own ruin by attempting to control production. The position of certain tobacco cooperatives is an illustration of this point. The restriction of crops and marketing of supplies on the part of the associations was the opportunity for expansion and selling on the part of non-members, which worked a severe financial hardship on members, they being left with large stocks and lowered prices. The non-members were the ones who profited. The same situation is almost certain to develop in any cooperative which tries to control price by holding stocks or reducing production, unless the cooperative represents far and away the most important source of supplies. This is because individual interest is opposed to group interest as explained earlier in this paper. Restriction by any part of the group is the occasion for expansion by the remainder, and is thus merely a device for shifting income out of the hands of those trying to restrict production into the hands of the others.

Another avenue of controlling production sometimes considered is legislation. Yet another avenue of controlling group production is through a purely educational program. The Outlook and Intention Reports of the Bureau of Agricultural Economics are examples. These attempt to inform producers of what is likely to happen so that they may modify their plans in accordance therewith. The educational approach is probably the most effective now in operation. On the whole,

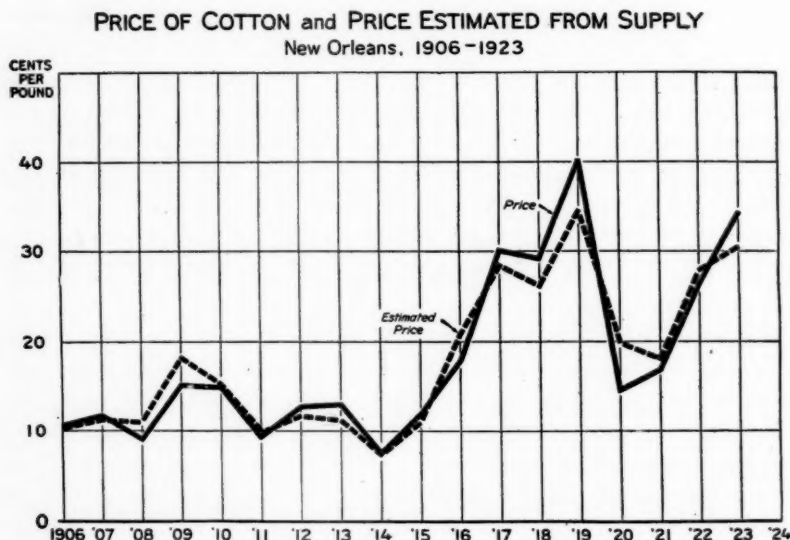
however, the prospect of obtaining a satisfactory control over agricultural production *at large* so that it may be consciously influenced to meet anticipated demand conditions seems pretty small. Until such a time occurs, therefore, attention should be given to what *individuals* can do. The importance of anticipating demand changes is thus paralleled by the importance of anticipating supply. For supply changes are responsible, as a rule, for a greater proportion of the variation in the price than demand changes.

This last then, the forecasting of supply, becomes of considerable significance to the individual producer. Since the individual cannot yet depend upon the control of production by the group as a whole, it is incumbent on him to take into account the effect of that group's course of action on subsequent prices and to benefit thereby. This would in itself tend to offset the effect of the group's action and bring about proper adjustment. It is after all but a method of repairing the defects in the existing price mechanism for obtaining best adjustments. It is a method of eliminating the lag between price incidence and price effects by using probable future prices as a basis for planning production rather than current prices.

The individual in laying out his program for the year must take into account a great number of factors such as what his land is adaptable to, the rotation and comparative costs of different crops, and many other things which obviously cannot be adequately considered here. But, as just proposed, one rather important factor in his decision should be the probable price of the possible products when it comes time to market them—not the price at the time he plants.

A first step in forecasting a price is to determine the factors which influence that price and to discover the statistical relations involved. Subsequently it becomes necessary to forecast the independent factors or ascertain the effect of related factors whose incidence and measurement is antecedent in time to the given price. The nature of this work can probably best be set forth by describing certain studies of this type which have been made. One of these studies has already been described: the relation between

the price of cotton, the supply of cotton, and the price level. A similar study was made, except that supply was measured as the difference between crop plus carryover and exports plus consumption up to January. As a means of studying the reliability and constancy through the period of the price-supply relations discovered, the actual price may be graphed together with the hypothetical price that should have occurred were the relationship fulfilled exactly.⁵ For convenience this hypothetical price may be termed the "estimated price" or "price estimated from supply." This estimated and actual price are graphed on this page. The closeness



of the two is immediately apparent upon inspection, the correlation being 0.965, demonstrating the validity of the relationship through this period and perhaps in the future, provided a common sense analysis shows that other general economic conditions do not vary more than in the period included in the study.

⁵The constancy of the relationship can be statistically measured for technical purposes to better advantage, by determining the joint correlation surface in which one dimension is time, a second supply, and the third the price minus terms of the regression equation other than the three being examined.

A more detailed study of the factors determining the price of cotton based on a period of 240 months has also been made.⁶ The New Orleans average monthly price of cotton from 1905 to 1925 was taken as the dependent variable and adjusted for changing money values. This adjustment took account not only of the value of money in this country but of the value of money in the countries purchasing our cotton and the exchange rates involved. The independent variables were (1) the actual supply of cotton, (2) the potential supply of cotton as measured by crop reports, the degree of saturation of the market as measured by (3) accumulated exports and (4) accumulated consumption, (5) the condition of business as measured by accumulated rates of general price change, (6) business optimism as measured by stock prices, and two time measurements, (7) trend and (8) seasonal. Since an assumption of linearity of relationship involved was not justifiable, methods of handling multiple curvilinear correlation problems⁷ were employed and the net functional relations of each independent variable to the dependent determined. Despite the disturbances to business of 1907, 1914, and 1921, the multiple correlation index was 0.983.

From these price studies it was demonstrable that one of the most important factors in determining the price of cotton was the supply of cotton. A next step in forecasting the price of cotton then is to ascertain if possible what the supply of cotton will be when the crop comes to market. The supply is to a considerable degree a function of the coming production; the problem then becomes one of forecasting the production.

Whatever influences the size of the crop must be effective through one of two channels, the acreage harvested or the average yield per acre. It is interesting to measure the proportion of variability in the production due to each of these factors, for the variation due to acreage is controllable, whereas variation due to yield per acre is largely uncontrollable, and

⁶ This study is described in detail in a forthcoming bulletin of the Department of Agriculture; "Factors Making the Price of Cotton," Bradford B. Smith.

⁷ "A Method of Handling Curvilinear Correlation for any Number of Variables," Mordecai Ezekiel. *Journal American Statistical Association*, Vol. XIX, No. 148, December, 1924.

thus measures the limits within which adjustments are effective, unless yield may be forecast and acreage modified accordingly.

Since the production is the product of the yield per acre and the acreage harvested, correlating the logarithm of production with the logarithms of yield per acre and of the acreage would give a perfect multiple correlation and it could hence be said (statistically) that the variability in the two independent factors completely determined the variability in the production. Coefficients of determination⁸ computed from correlation of these logarithms for the period 1900-1924 inclusive showed that 54.4 per cent of the squared variability in the production was due to variation in yield per acre and 45.6 per cent due to variation in acreage.⁹ But since these coefficients were computed from series covering long periods wherein much of the variability might be attributable to trend changes in acreage, coefficients of net determination after the elimination of variability attributable to the trend elements were computed.¹⁰ These showed that the determination of cotton production by yield per acre and acreage changes remained unchanged. This was due to the compensation of trend changes in acreage by trend changes in yield per acre.¹¹

These coefficients show that for cotton nearly half of the variation in production has been due to acreage changes and thus represents a fair range of adjustment possibilities. It might be pointed out in passing, furthermore, that adjustment by acreage change is of more significance to producers as a group than adjustment by yield, for total expenses (ex-

⁸ "Forecasting the Acreage of Cotton." Bradford B. Smith. *Journal American Statistical Association*. Vol. XX, No. 149, March, 1925. Note p. 42.

⁹ Corresponding figures for Winter Wheat were 23.2 and 76.4; for Spring Wheat, 91.2 and 8.8.

¹⁰ Since the system already represents perfect correlation, net simultaneous solutions vanish. It is therefore necessary to eliminate linear trends consecutively and then re-correlate. This same process may be more easily accomplished by finding the determination of each independent by deviations from trend and multiplying these coefficients times the determination of the production by the respective independents, which thus gives the determination of the production by the deviations from trend in the independents. Expressing these as percentages of their sum gives the determination of deviations from trend in production by deviations from trend in yield per acre and acreage.

¹¹ After eliminating trend variability, winter wheat production was 36.5 per cent determined by yield variations and 63.5 per cent by acreage. Corresponding figures for spring wheat were 93.8 and 6.2.

cept harvesting) tend to parallel acreage whereas total value of the crop tends to be a constant under given demand conditions thus automatically taking care of yield variations in so far as producers' profits are concerned. For the individual, however, price is of more significance, except to the degree that his individual yield per acre is correlated with the average. Since about one-half of the variability in production—and hence in price changes following production changes—is due to acreage changes it is desirable for the individual to forecast acreage changes as part of the process of forecasting prices.

The acreage of cotton can be forecast with comparative accuracy on the basis of the following hypothesis.¹² High prices of cotton relative to other agricultural products induce producers to expand the production of cotton. The converse is also true. Thus acreage changes may be related to relative prices in the planting or pre-planting period. This was done. The price of spot cotton in December at New York as a relative of the Bureau of Labor's Index of Farm Products was correlated with increase or decrease in acreage harvested the following fall expressed as a percentage of the preceding season's acreage.¹³ The correlation was 0.94 which is sufficiently high to suggest its usefulness as a means of forecasting acreage changes at the very beginning of the calendar year. On the basis of this relation the estimates of acreage change were computed and graphed with the actual changes that took place. These may be observed in the figure on p. 162 to show a very close agreement.

The relationship discussed earlier wherein cotton price changes over preceding years were related to cotton acreage changes over preceding years is also adaptable for forecasting acreage in periods where the annual cycles predominate over longer period demand-induced cycles.

Turning now to the question of forecasting yield per acre, it might be profitable to ascertain if there be any definite periodicity in the cotton yields. If so this periodicity would serve as a means for anticipating the coming yield, by ascer-

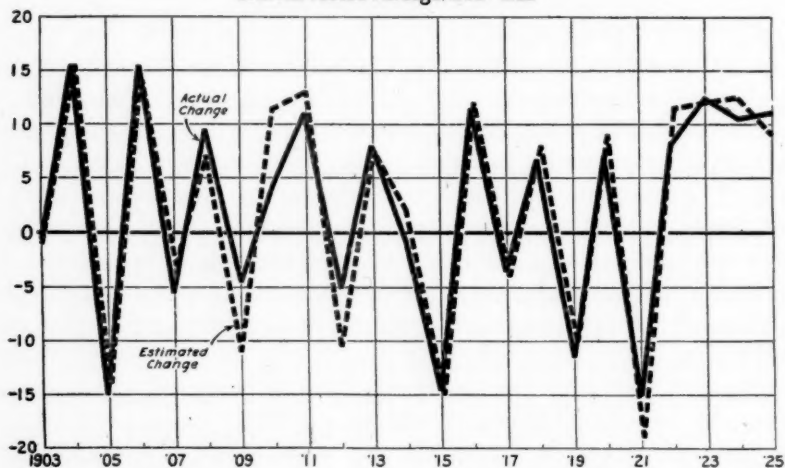
¹² A slightly different statistical treatment of this problem was presented by the author in an article previously cited in note 6.

¹³ This will be recognized as a semi-first difference method of correlation.

taining what phase of the cycle would be in force. A study was made to discover if such a periodicity existed. The method used differs from the usual harmonic analysis. It was as follows:

Annual average United States cotton yields per acre for a period of fifty years were employed. Deviations from several moving averages centered were computed. The number of years included in the moving average was identical with the length of cycle being tested for, thus eliminating every phase of the cycle and furnishing a base which had no element of cycle influence in it. The period which showed the most significant cycle was 7 years. The years were accordingly numbered throughout with a recurring series of 1 to 7 so that

ESTIMATED AND ACTUAL PERCENTAGE CHANGES
FROM PRECEDING YEAR IN COTTON
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all years having the same numerical designation could be considered to be in the same phase of a seven-year cycle. The computed deviations from moving average for all number "one" years were averaged, for all number "two" years and so on up to all number "seven" years. These averages when plotted formed an almost perfect cycle requiring practically

no smoothing.¹⁴ It is interesting to note that, according to this, 1925 and 1926 are peak years in the cycle.

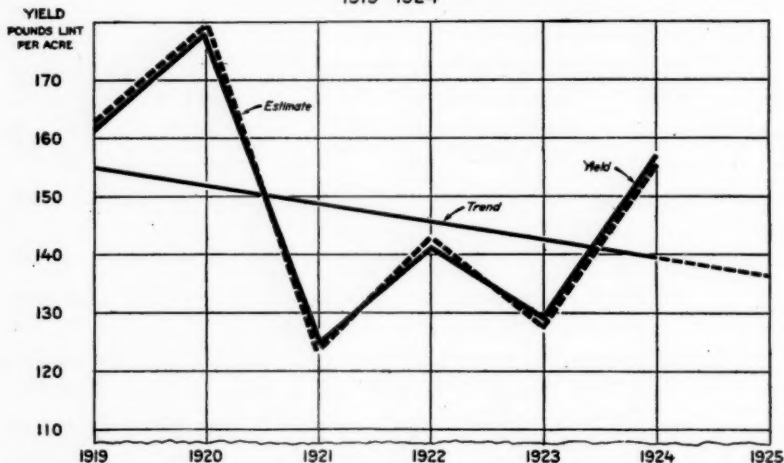
As a measure of the importance of the cycle in the total yield deviations, these cycle indices were correlated for the period with the original deviations. This gave a correlation coefficient of 0.441, which is almost six times its probable error. Nevertheless the correlation is entirely too low for any purpose except to evidence that there may be some persistent cycle. This method of forecasting yields per acre in advance is thus inadequate.

Another possible method of forecasting the yield of cotton per acre a whole year in advance was discovered in an attempt to find some relation between coldness in winter and boll weevil damage in the following season. The study covered temperatures from the first of November until the last of March for the six years, 1919-1924. Telegraphic Weather Bureau stations were used, three in the Northwest cotton belt to measure cold waves as they came into the cotton belt and three in the Eastern belt to measure how completely the cold waves crossed the belt. The data used were minimum daily temperatures. More weight was given to low temperatures than high. Temperatures above 32°F. were given a weight of zero since such temperatures could work little injury to hibernating weevils. Low temperatures for a number of consecutive days, however, were given more weight than low temperatures interspersed with high temperatures, since the former meant greater penetration. The index was constructed by summing the daily temperatures so weighted for the five months' period, giving an aggregate. The aggregate for each year for each station was expressed as a relative of the average aggregate for that station during the six years. The annual index was then obtained by adding together the relatives for the six stations for the given year. The index, then,

¹⁴ The average for number "one" years (of which 1919 was a case was.....			plus 8 lbs. per acre
For number "two" years.....	"	4	"
" " "three" years.....	"	0	"
" " "four" years.....	"	1	"
" " "five" years.....	minus	16	"
" " "six" years.....	"	5	"
" " "seven" years.....	plus	9	"

is a measure of the amount and concentration of coldness in the cotton belt during the winter. When this index is compared with the average yield per acre of cotton in the following season the relationship revealed is strikingly close, the correlation being 0.992. The graph on this page shows the

U. S. YIELD OF COTTON and YIELD ESTIMATED
FROM WINTER WEATHER INDEX
1919-1924



average yield per acre for the six years and the yield as estimated by the described relationship to the winter temperature index. The closeness of the two suggests the usefulness of this type of index in forecasting the average yield per acre before the crop is even planted.

On the other hand, I do not feel that any satisfactory hypothesis as to why the winter temperature index just described should coincide so closely with yields in the following year has yet been advanced. The index therefore has nothing save the fact that it has worked in the past six years to encourage placing confidence in it. If, however, it sometime becomes possible to develop methods, perhaps along the lines used in the described studies, whereby accurate forecasting of agricultural supplies can be performed, such studies can be conjoined with those which analyze and forecast the influence

of supply, and other factors, upon price. An adequate basis will then be available to the individual for planning production adjustments. It must be remembered, however, that as this type of adjustment is undertaken by more and more producers the opportunity for this type of adjustment will become less and less, for the action of these producers will then become an element of increasing importance in determining supply, thus eliminating the supply-induced fluctuations in price which make this type of adjustment profitable.

In such circumstances then, the forecasting of the demand schedule becomes of prime importance to producers both individually and collectively. And the application of this information requires thorough education and cooperation on the part of the producers in then determining the extent and location of the acreage necessary to produce the most profitable supply. In essence this supposes the elimination of lag between price incidence and price effect on production—the use of foresight rather than “hindsight”—the identifying of individual with collective interest. When such a time comes we may feel that real progress has been made in scientifically adjusting agricultural production to demand. This may be taken as a somewhat distant but perhaps not unattainable goal.

STUDIES OF AGRICULTURAL ADJUSTMENTS AS THEY AFFECT INDIVIDUAL FARMS ¹

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The focal point in agricultural adjustment is the individual farmer. Any adjustment in the production of staple farm products is the sum total of the individual adjustments of farmers. Numerous speeches may be made, volumes may be written, forecasts may be promulgated, all dealing with desirable adjustments, but if individual farmers are not stirred to action nothing will result. On the other hand, if farmers act but do so unwisely the results may be more serious than if nothing had been done. One of the chief problems in agricultural adjustment is to interpret the desired changes in terms that are pertinent to the farmers concerned and to present the information to them in a way that commands their confidence and encourages them to act upon it. It is with a method of studying these problems of individual farmers that this paper is concerned.

Agricultural adjustment is a term used to describe, collectively, changes in farm production which will result in the greatest profit to the farmers. It is an attempt to avoid agricultural surpluses and deficits. The Joint Committee on Projects and Correlation of Research of the Association of Land-Grant Colleges and the United States Department of Agriculture meeting in St. Louis, May 4 and 5, 1925, adopted the problem of surpluses as one of six problems of national scope constituting subjects for cooperation between the United States Department of Agriculture and the experiment stations. This problem of surpluses and the problem of the distribution and marketing of farm products were referred to a committee which in turn appointed a subcommittee to

¹This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association held in New York City, December 29, 1925. The paper is a description of the objectives, of the methods used, and of the data available for a study conducted cooperatively by the Federal Bureau of Agricultural Economics and the Kansas Agricultural Experiment Station. No attempt is made to give any conclusions or to present any data in an analytical way. All data presented are intended to illustrate the methods used in the study, the data available for the study, and the objectives of the study.

consider the nature and the significance of agricultural surpluses. Agricultural adjustment is of the utmost importance and it is receiving careful attention from those charged with investigational responsibilities. The study described in this paper deals with one phase of this problem of surpluses.

Surpluses or deficits of farm products are the result of two groups of forces. First are varying seasonal conditions which increase or decrease agricultural production. These forces are only partially under the farmer's control, although we are constantly learning better how to control them through better crop varieties and improved production practices. The second group of forces are the actions of farmers in varying the acreage of crops, the number of livestock, or the intensity of the production of either crops or livestock. Individual farm adjustment is concerned primarily with the latter group of forces. It is to be noted that complete adjustment is impossible at any given time due to inability to control seasonal variations.

The adjustment secured on individual farms will be the result of influencing farmers in the acreage devoted to various crops, in the methods of production used which influence yields, in the numbers of livestock raised and marketed, and in the production methods influencing the quantity and quality of the meat and livestock products reaching market. To exert these influences in the right direction, information concerning the present and probable future supply of and demand for farm products is needed. Such information needs to be analyzed and presented in usable form. It constitutes the information which has been presented in the various outlook reports of the United States Department of Agriculture and other agencies.

The outlook materials have dealt with the production and consumption of the commodity for the entire nation and in the case of products such as wheat the world situation has been presented. The application of this information to the production problems of farmers is not uniform for the farms in all regions or for all farmers within a region. As an illustration, it may be desirable that the total wheat acreage of the United States be reduced. However, it does not follow that

every wheat grower should reduce his acreage by a certain percentage. Perhaps some farmers should abandon wheat production, others may find it to their economic advantage to increase their wheat acreage, and there may be all variations between these two extremes. It is necessary to consider the conditions of the farmers concerned to determine how adjustment of the wheat acreage may be secured. Obviously it is impossible to consider the conditions and the problems of every individual farmer, but the same purpose can be secured (1) by determining for a given region type of farming areas where farmers respond to changing market and production conditions in a fairly uniform way, (2) by dividing the farms in a type of farming area into size groups, and (3) by determining the various types of farming within each size group. This will divide the farms into type of farming areas, into size groups within these areas, and types of farming on farms within the same size group.

In this way it is possible to determine typical farms and the relative importance of each type to the agriculture of the region. These typical farms can then be studied to determine the changes in production which should be made in response to changes in prices of various farm products and to changes in the cost of labor and materials used in the production of these commodities. Data permitting such studies are available for Kansas and such studies are now in progress in cooperation with the Federal Bureau of Agricultural Economics.

The Kansas assessors secure certain pertinent agricultural data each year. These data include for each farm the acreages of the principal crops, the total farm area, the numbers of the various kinds of livestock, certain production data on crop yields and livestock and livestock products sales, and information concerning the possession of certain types of farming equipment such as tractors, combined harvester-threshers, cream separators, and silos. These data are available for every farm in the state that is assessed for property taxation purposes. Data for all farms are available for the last ten years and for all counties for nearly half a century. These data

lend themselves to consideration as individual farms or by townships, counties, or the state as a whole.

Other farm organization data available include results from cost routes in four parts of the state and the results of a number of enterprise and farm business analysis surveys. These data permit the division of the state into type of farming areas based upon the percentage of the acreage in important crops, the numbers of livestock per hundred acres of crop land as given by the 1920 census, and upon the personal knowledge of men working with the data.

These areas were then compared with respect to changes in the acreage of wheat from 1911 to 1924. It was found that in practically all cases the counties within each area changed their wheat acreage in very similar proportions but that the changes in the different areas were often quite different. Similar comparisons in the changes of the acreages of other important crops and of the numbers of the various kinds of livestock are to be made.

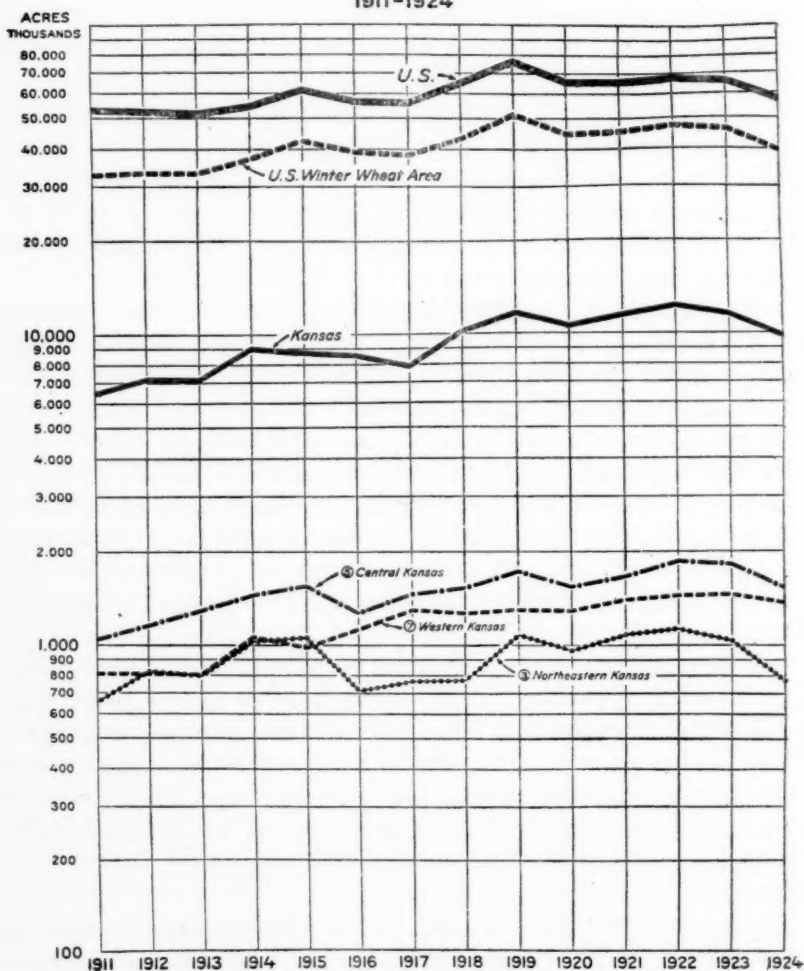
These comparisons indicate the response of these various groups of farmers to changes in economic conditions. All do not respond in the same way. Quite often the different groups respond in decidedly different ways to the same change. To understand these responses it is necessary to analyze the farmers' conditions. Soil, climate, size of farm, available labor, fixed resources in machines, buildings, and motive power, the varying influence of improvements in production methods, practices, and equipment, are all factors which may be included among those influencing the farmer's response to changing prices.

It should be noted further that the prices of different grades or kinds of a product do not always move in the same way. Wheat is an example. The soft red winter wheat of eastern Kansas has not been in so keen demand in some years as has the dark hard winter wheat of western Kansas. These changes in demand as reflected in market prices have undoubtedly played their part in influencing the changes made by the farmers.

Figure 1 shows the trends of the wheat acreage seeded in the United States, of the United States winter wheat acreage

of the Kansas wheat acreage, and of the wheat acreage seeded in three types of farming areas in Kansas. It is evident that Kansas did not respond to lower wheat prices in 1920 with so great a decrease in acreage seeded as did the United States. Within the state, central Kansas and northeastern Kansas both showed declines while western Kansas continued to ex-

Fig. 1.—TRENDS OF WHEAT ACREAGE IN THE UNITED STATES BY AREAS
1911-1924



pand the wheat acreage. For example, six counties in southwestern Kansas increased their seedings of wheat in 1920, in 1921, and in 1922 in spite of low prices and by 1923 these counties were seeding from two to twenty times as large an area as had ever been seeded before the war and an area far in excess of that seeded during the period of the World War. Such a change must find some explanation other than in low wheat prices. A study such as is being described seeks to find the causes of the changes made by the farmers in such an area. With a knowledge of these causes it is possible to make much more usable suggestions concerning ways in which the farmers may utilize outlook materials in profitably adjusting their production programs.

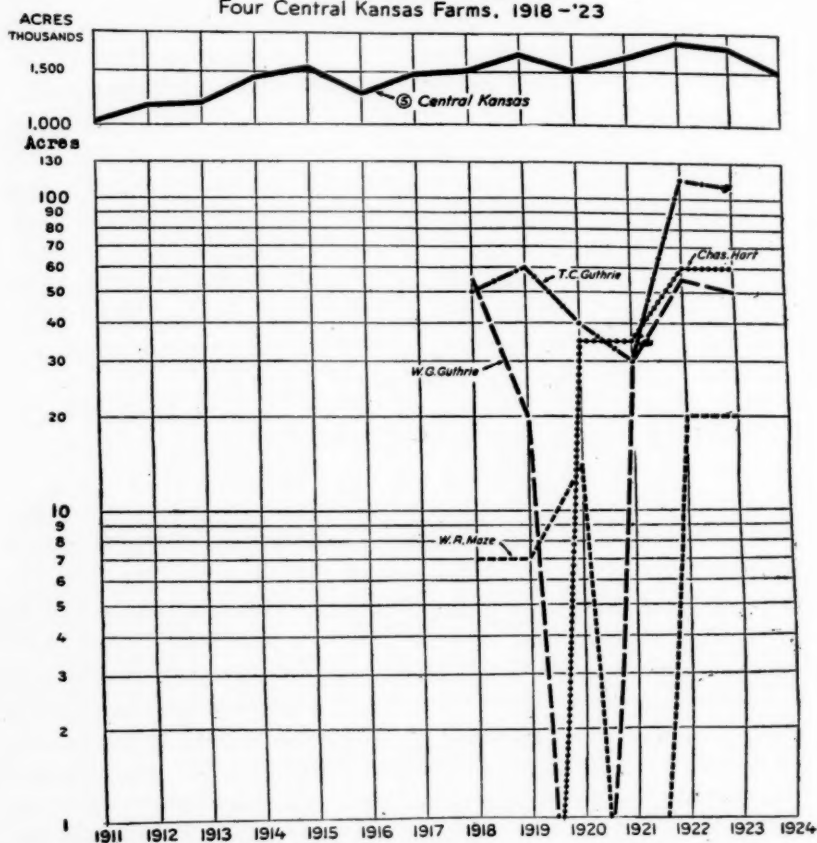
Figure 2 shows the fluctuations in the wheat acreage seeded in central Kansas which is in the center of the hard winter wheat belt and the fluctuations on four farms within the area. These four farms illustrate the extreme fluctuations frequently found on farms in this region. Studies of the fluctuations on individual farms indicate that the fluctuations from farm to farm are far wider than the fluctuations in the entire region. Any information which will permit farmers to adjust their production more intelligently will undoubtedly reduce the fluctuations on individual farms.

The procedure followed in a study of ways in which the farmers can adjust their production program to probable changes in demand includes the determination of the type of farming areas and the groups of farms as previously indicated. Production data for a number of years should be available for this purpose. In studying the changes, data on the prices of farm products important to the area and the prices or costs of materials and labor utilized in producing these products should be at hand for each year that production data are available. Detailed farm organization studies and surveys of particular farm enterprises give the labor and material requirements in producing the farm products of the region. The application of these labor and material data and their costs to the typical farm organizations permits a study of the influence of changes upon probable profits and the ways in which farmers respond under these conditions. These studies

aid in determining the underlying causes of the farmer's response to changed conditions and indicate the extent to which the farmer's actions may be influenced.

These production and price data can also be combined on the basis of probable future prices and costs.² These probable future prices and costs must be estimated on the basis of outlook forecasts. It is desirable to use several estimates or to determine limits within which prices and costs will probably

Fig. 2.—YEARLY FLUCTUATIONS OF WHEAT SOWN
Central Kansas ⑤ 1911-'24
Four Central Kansas Farms, 1918-'23



² For an illustration of the method used in applying these data to typical farm organizations, see *United States Department of Agriculture Bulletin 1296*, pages 60-74.

fluctuate. Such studies of typical farms indicate the groups of farms that can change to advantage and the probable importance of each group or area in effecting any desired change.

It may seem that such a study is a decided departure from the kind of studies previously undertaken by research agencies. In some ways it is a departure, yet in other ways it is merely broadening studies previously undertaken. One does not have to look far into the published results of investigational work to find recommendations to increase or to decrease certain lines of production. More recently, the published studies of food consumption, production, and distribution within a given area have included recommendations for increases or decreases in the production of specific products. All of these recommendations for changes must of necessity assume that the future market will be favorable for the suggested changes. In brief, a forecast of the future outlook has been either assumed or stated. The present study takes the best available forecasts and farm organization data and on this basis determine the probable effect of changes and their consequent advisability.

Such studies make it possible to determine the types of farms and the farming areas where adjustments can be most easily and profitably made and the probable extent to which these farms can adjust their production. Such an approach to the problem of adjusted production is believed to be much more productive of desired results than blanket suggestions for all producers of a particular product. The most desirable condition would be a careful study of the conditions on each farm, but such a study is impossible of attainment. The nearest approach to it is believed to be the study of typical farms representing the majority of the farms of the area and then suggesting adjustments on the basis of the effect of forecasted changes upon these typical or representative farms.

BATTING AVERAGES IN AGRICULTURAL FORECASTING ¹

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Batting averages in agricultural forecasting, in so far as it has been possible to investigate them, show about the same degree of perfection as human judgment has shown in other lines. At best agricultural forecasts are generally about 65 to 75 per cent perfect. There are some exceptions depending upon the length of time covered by the forecast and upon the purpose to be served, as is noted later.

The possibilities in agricultural forecastings are likely to be appraised in accord with one's conception of the essential nature of such a forecast. If it is believed that the success of such a forecast rests upon a certain secret and mysterious power to prophesy and that only those possessed of these occult powers can succeed, then to every one except the afflicted few the possibilities in attempting such a thing are ludicrous. If, on the other hand, it is believed that the success of the forecast depends entirely upon the right kind of mechanical manipulation of the statistics of past events, then anything short of 95 to 100 per cent efficiency will be disappointing. If, however, the agricultural forecast is considered as simply judgment of future performances as indicated by currently observable points of strength and weakness, using the best methods possible, then this forecast is not unlike judgment passed in many other cases where no one thinks of associating either mystery or infallibility with the conclusions reached.

Difficulties in Carefully Appraising the Accuracy of Agricultural Forecasts.

Several sets of circumstances combine to make impossible a careful appraisal of the accuracy of agricultural forecasts at the present stage of their development. In the first place, such forecasts have been systematically attempted for only a few

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 29, 1925.

years. Many such forecasts have been made only intermittently and thus have avoided trends difficult to predict. Some of the forecasts are not at all clear-cut in their pronouncements. Terms used in the forecasts are not standardized as to meaning. Such terms are "strong," "relatively weak," "easy," "normal," and even in one case "pyrotechnical." Furthermore, many forecasts are made without direct reference to any particular central market price or without designating any particular class, type, or quality of the commodity being considered. This makes it difficult to check the forecast against anything more than general average prices.

In such cases the accuracy or error shown for the forecast may be due as much to the vagaries of the average as to any judgment as to what was going to transpire. For instance, in the summer of 1925 hogs on the Kansas City market reached their high point on August 4. However, the August average price for hogs at Kansas City was below the July average. This was due to the comparatively low prices reached toward the end of August. Predicting, as in the case of the *Kansas Agricultural Situation*, from July 10 to August 10 or thereabouts one might have predicted a rise in price and have been correct as far as the general day-to-day trend up to the first part of August was concerned. On the basis of monthly average prices it would have been necessary to predict lower hog prices for August than for July to have been correct. All these points, however, will come out in the discussion of the types of forecasts used to supplement this discussion.

Three month-to-month forecasts for 1925 dealing with the four farm commodities wheat, corn, hogs, and cattle, have been summarized by the writer. In addition, several forecasts for various periods have been summarized by others and are cited.² These forecasts have been selected not because of their superiority over other forecasts but because they have at least to some degree reported monthly and are typical of others that were available for study. Equally good work or perhaps better

² Commercial forecast No. 2 and a summary of the *Agricultural Outlook* reports of the United States Department of Agriculture for 1924 and 1925 were reviewed by staff members of the Bureau of Agricultural Economics, United States Department of Agriculture, and a copy of findings furnished the writer by Mr. M. J. B. Ezekiel.

A summary of the forecasts in *Farm Economics*, Cornell University, was furnished by Dr. Pearson of the Department of Agricultural Economics, Cornell University.

has been done at Minnesota and New Jersey with potatoes. Moore and others have done work with cotton. Numerous other cases could be pointed to, but all cannot be considered in the space allotted this paper.

Kansas Agricultural Situation Forecasts 1925

The first set of forecasts referred to are those issued by the Kansas State Agricultural College. This set of forecasts is referred to first because the writer, being acquainted with the exact price bases upon which these forecasts were made, can better point out with some precision the nature of errors and the probable shortcomings in methods. Referring to Table I, two distinct misses on wheat are recorded—the August and November forecasts. The misses are marked with small stars. The May forecast is questioned. It is correct with regard to low grade No. 2 wheat but incorrect for best quality No. 2. There is a possibility of three or four misses out of twelve forecasts. On corn (Table II), there was a clear miss in March. In May there was a miss on top No. 2 mixed corn and a hit on bottom No. 2. An average would show no price change. As a more significant advance than this was really expected, the May forecast is classed as a miss. October is questioned. Prices declined as anticipated, then rebounded, and closed higher before the 30-day period was up. The corn forecast will show not more than two to four misses. In the case of hogs (Table III) the August forecast may be classed as a miss. The May forecast might be questioned. One to two or not more than three misses can be charged up in the case of hogs. In the case of cattle (Table IV) there was a clear miss in April and questionable forecasts in July and August. There are not more than two to four misses in the case of cattle.

Commercial Forecasts 1925

Referring to the commercial forecast and noticing wheat first (Table V) four misses are recorded using the price base indicated. In fairness to this and other forecasts commented upon it should be noted that, because there was no way of knowing what particular price base is referred to, the one used

**KANSAS STATE AGRICULTURAL COLLEGE MARKET FORECASTS
FOR 1925**

TABLE I

	Wheat Forecast	Wheat Price Change (1)
January	Further holding of wheat will be on a highly speculative basis.	Jan. 10, 1.95; Feb. 10, 1.94; Feb. 11, 1.89; Feb. 13, 1.85.
February	A Kansas City price much above the lower level of last week (1.97) will meet with resistance in the cash market.	Feb. 10, 1.94; Mar. 9, 1.89; Mar. 10, 1.93; Mar. 13, 1.79.
March	The late February advance to within a few cents of highest January levels is enough to make some recessions in March prices probable.	Mar. 10, 1.93; Mar. 31, 1.58; Apr. 9, 1.70.
April	Liquidation of speculative holdings has perhaps contributed to too large a decline. Wheat is fundamentally in a stronger position than a month ago.	Apr. 9, 1.70; Apr. 11, 1.80; Apr. 13, 1.76; Apr. 15, 1.74; May 9, 1.73.
May ?	Some weakness in prices may be expected by the last of May or the first part of June.	May 9, 1.58; May 29, 1.73; May 22, 1.73; May 29, 1.78; June 10, 1.90; Low No. 2 June 12, 1.55; June 15, 1.51.
June	The market has probably reached a point where it has taken into account most of the known bullish factors likely to affect the market during the next month.	June 10, 1.90; June 15, 1.82; June 30, 1.62; July 10, 1.58.
July	There are about 9 chances out of 10 that wheat prices will be somewhat higher sometime before the middle of October though further declines are to be expected.	July 10, 1.58; July 17, 1.73; July 31, 1.66; Aug. 10, 1.82.
August*	A further increase in wheat prices is suggested by a majority of important market factors.	Aug. 8, 1.81; Aug. 9, 1.82; Aug. 13, 1.80; Aug. 31, 1.68.
September	There is little in the present situation to urge the selling of hard winter wheat at prices prevailing at the close of Aug.	Aug. 31, 1.68; Sept. 10, 1.65; Sept. 15, 1.69; Sept. 17, 1.71; Sept. 30, 1.62; Oct. 10, 1.69.
October	The wheat market is at a point where the movement of a large Canadian crop is likely to depress it.	Oct. 10, 1.69; Oct. 19, 1.70; Oct. 23, 1.62; Oct. 31, 1.66; Nov. 10, 1.67.
Nov.*	Steady to lower prices during the next 30 days.	Nov. 10, 1.67; Nov. 20, 1.70; Nov. 30, 1.71; Dec. 7, 1.82; Dec. 10, 1.76.
December	Steady to higher price now likely.	Dec. 10, 1.76.

(1) Price bases are top No. 2 hard winter wheat Kansas City.

is of the writer's own selection and was chosen with the idea of averaging as wide a range of conditions as possible. In the case of corn (Table VI) this commercial forecast shows four misses out of twelve. On hogs (Table VII) this forecast shows three misses and a fourth that should probably be classed as a miss, although because the Chicago average did show a decline the July forecast was given the benefit of the doubt. This agency ceased making forecasts on cattle after the January forecast which was a distinct hit for about all classes of cattle.

KANSAS STATE AGRICULTURAL COLLEGE MARKET FORECASTS FOR 1925

TABLE II

	Corn Forecast	Corn Price Change (1)	
January	Temporary dullness.	Jan. 10, 1.18½; Feb. 10, 1.16.	Jan. 15, 1.21½;
February	Temporary weakness in sympathy with wheat.	Feb. 10, 1.16; Mar. 9, 1.15;	Feb. 16, 1.11; Mar. 10, 1.16½.
March*	Some advance in corn prices by April.	Mar. 10, 1.16½; Apr. 11, 1.05.	Apr. 9, .99;
April	Improvement over recent low levels.	Apr. 9, .99;	May 11, 1.09.
May*	Further advances but no spectacular advance.	May 11, 1.09; 1.06; 1.08;	June 10, 1.08½; 1.07½ [Low
June	Further strengthen corn prices.	June 10, 1.08½; July 10, 1.03½;	June 30, .98; July 11, 1.11.
July	Moderate advances over the low level of the latter part of June are to be expected.	July 10, 1.03½; July 18, 1.11;	July 15, 1.07; Aug. 10, 1.03.
August	Stationary or declining market.	Aug. 10, 1.03; Sept. 10, .94.	Aug. 31, .87½;
September	Still lower corn prices are in prospect.	Sept. 10, .94; Oct. 10, .84.	Sept. 30, .82;
October ?	Further declines in corn prices are evident.	Oct. 10, .84; Oct. 31, .85;	Oct. 23, .80½; Nov. 10, .87.
November	Further seasonal declines in corn prices are to be expected.	Nov. 10, .87; Nov. 30, .73;	Nov. 16, .89; Dec. 9, .77½;
December	Weak with chance for improvement by end of 30 to 60 days.	Dec. 9, .77½.	

(1) Price bases are top No. 2 mixed corn Kansas City.

KANSAS STATE AGRICULTURAL COLLEGE MARKET FORECASTS
FOR 1925

TABLE III

	Hog Forecast	Hog Price Change
January	Stronger prices.	Jan. 10, 10.30; Jan. 28, 10.95; Feb. 10, 11.15; Feb. 11, 12.50.
February	Price trend upward.	Feb. 10, 11.15; Feb. 28, 12.30; Mar. 10, 13.85.
March	Recent advance largely discounts bullish factors but present levels probably be maintained to middle of April.	Mar. 10, 13.85; Mar. 17, 14.30; Mar. 31, 12.75; Apr. 10, 13.05.
April	Moderate declines probable.	Apr. 10, 13.05; Apr. 20, 11.90; Apr. 30, 11.25; May 11, 12.50.
May ?	Temporary weakness then improvement.	May 11, 12.50; May 15, 11.50; May 22, 12.45; May 29, 11.85; June 10, 11.85.
June	Improved prices during next 30 days.	June 10, 11.85; June 30, 13.45; July 10, 13.75.
July	Tendency in prices upward.	July 10, 13.75; July 16, 14.15; July 31, 13.80; Aug. 10, 13.90.
August*	A further rise in hog prices is indicated with declines the first part of August.	Aug. 10, 13.90; Aug. 20, 13.15; Aug. 31, 12.80; Sept. 10, 12.80.
September	The present hog situation suggests no prolonged price decline until toward the middle of October and makes possible some improvement over recent levels.	Sept. 10, 12.80; Sept. 19, 13.35; Sept. 25, 13.70; Sept. 30, 13.25; Oct. 10, 12.00.
October	A seasonal decline in hog prices but one more moderate than the average for this time of year appears ahead.	Oct. 10, 12.00; Oct. 31, 11.30; Nov. 10, 11.65.
November	Some further seasonal decline in hog prices is to be expected.	Nov. 10, 11.65; Nov. 20, 11.30; Nov. 30, 11.25; Dec. 10, 11.50.
December	Further decline likely before any improvement.	Dec. 10, 11.50.

United States Department of Agriculture Market Forecasts
1925

The third set of forecasts called attention to are those of the United States Department of Agriculture reported in the monthly supplement to *Crops and Markets* under the heading "The Price Situation." It might be said here that the Department's outlook reports are more in the nature of agricultural forecasts designed to serve as a basis for production programs. About this type of forecasting something will be said later. These "Price Situations," therefore, perhaps sum up the De-

partment's forecasts that would serve as a basis for marketing programs about as well as any reports that were available for use by the writer.

The Department's forecasts of wheat (Table VIII) show a clear miss in May and several questionable forecasts. Unfor-

KANSAS STATE AGRICULTURAL COLLEGE MARKET FORECASTS FOR 1925

TABLE IV.

	Cattle Forecast	Cattle Price Change (1)			
January	Not much prospect for rise until April.	Jan. 10, 8.30; Jan. 24, 8.53;	Jan. 17, 8.54; Feb. 7, 8.50.		
February	Lower prices until near close of 30-day period.	Feb. 7, 8.50; Feb. 21, 8.14;	Feb. 14, 8.18; Mar. 7, 8.72.		
March	Improved prices to be expected except for calves for which seasonal tendency is downward.	Mar. 7, 8.72; Mar. 21, 8.83;	Mar. 14, 8.85; Apr. 11, 9.12.		
April*	Market continue strong.	Apr. 11, 11.38; Apr. 11, 9.12; Apr. 25, 11.08; Apr. 25, 9.04;	choice 11.34; Apr. 18, 9.18; Apr. 18, 11.11; May 9, 9.04.		
May ?	Prospects for advancing prices of good beef steers are excellent.	May 9, 10.18; May 9, 9.04; May 30, 9.92; May 30, 8.85;	good 10.25; May 16, 9.16; May 16, 10.30; June 6, 9.12.		
June	Further improvement in prices to be expected.	June 6, 9.12; July 4, 9.31;	June 13, 8.94; July 11, 9.06.		
July ?	Finished cattle at least steady.	July 11, 12.50; July 11, 9.06; July 25, 13.20; July 25, 8.94;	choice 12.95; July 18, 8.98; July 18, 13.81; Aug. 8, 8.86.		
August ?	Steady to strong prices for fed cattle.	Aug. 8, 13.81; Aug. 8, 8.86; Aug. 29, 13.79; Aug. 29, 7.99;	choice 14.12; Aug. 15, 8.45; Aug. 15, 14.03; Sept. 12, 7.98.		
September	Some easing up in all cattle prices to be expected with medium to heavy weight, good to choice steers remaining generally strong.	Sept. 12, 11.25; Sept. 12, 7.98; Sept. 26, 11.31; Sept. 26, 8.40;	good 11.37; Sept. 19, 8.24; Sept. 19, 11.42; Oct. 10, 8.28.		
October	Medium to heavy, good to choice steers are likely to hold closely to the present price level. A small decline is to be expected for most other classes.	Oct. 10, 11.42; Oct. 10, 8.28; Oct. 31, 10.95; Oct. 31, 8.01;	good 11.31; Oct. 17, 8.14; Oct. 17, 10.95; Nov. 7, 8.10.		
November	Further seasonal decline in cattle prices are to be expected.	Nov. 7, 8.10.			
December	Steady to slightly lower on most stuff.				

(1) Steers 1,000# down average weekly.

unately all of these "price situations" did not make clear pronouncements as to what was expected in regard to future trends. For this reason percentage error can hardly be figured. The Department has one clear miss on corn in June (Table IX). It is indefinite in the May write-up and entirely non-commit-

COMMERCIAL FORECAST NO. I FOR 1925
TABLE V

Wheat Forecast	Farm Price of Wheat
*January—Underlying conditions suggest inactivity pending the distribution of foreign crops.....	162.1
February—The average price during the past month is dangerous ground	169.8
March—Speculation still dominant. Buy only for current needs.....	164.0
April—Much of bearish influence discounted. Purchases on reactions practical	140.5
*May—The recent advance counteracts much of the bullish influence. Heavy purchases should be postponed.....	149.1
*June—It is apparent from the current report that the statistical position will not warrant any radical price shakedown.....	152.7
*July—Seasonal pressure on the downward side. No prolonged price readjustment	140.3
August—The advance discounts most of bullishness temporarily.....	150.4
September—Heavier purchases should be deferred. Much uncertainty exists	144.4
October—There is no basis for a further material price decline. Accumulations or breaks should be considered.....	136.4
November—Price advance may have been too rapid. Wait for concessions before accumulating more heavily.....	148.8
December—	

COMMERCIAL FORECAST NO. I FOR 1925
TABLE VI

Corn Forecast	Farm Price of Corn
*January—Market should work lower.....	112.0
February—Market should work lower before registering any marked upward swing	114.5
March—Market should work lower.....	112.1
April—Considering the break of 20 per cent current quotations are more in line with fundamental conditions.....	103.8
May—Seasonal element favors strength through spring and summer.....	107.5
*June—Seasonal elements favor a well-maintained market.....	111.0
July—No sound basis for buying heavily at this time.....	104.4
August—Some purchases especially on reactions logical through the summer	106.5
*September—Seasonal influences largely counteracted. Accumulate at least a part of seasonal needs.....	98.8
*October—A sharp price slump not indicated. Purchase on weak markets	83.0
November—Seasonal needs accumulated on weak markets over next month or so should prove satisfactory.....	74.6
December—	

tal in the July write-up of the price situation. Otherwise the Department's forecasts of corn price trends are better than almost any other examined. In the case of hog price trends, the Department registers three misses (Table X). In the case of cattle, the reports are much less satisfactory

COMMERCIAL FORECAST NO. I FOR 1925
TABLE VII

Hog Forecast	Farm Price	Chicago Average (1)
*January—Irrregularity and weakness probable.....	9.31	10.40
*February—A lower market could easily develop but any reaction will be followed by rebound.....	9.62	11.05
March—The advance has probably been too rapid to be healthy. This is a short swing movement which is anybody's guess.....	11.83	13.55
April—Much of the bullish influence is discounted. Price irregularity inevitable.....	11.64	12.60
May—What the market will do during the next few weeks is anybody's guess. Purchase on substantial reactions.....	10.78	12.10
*June—Prices now 74 per cent over the low of last year and discount most of the strength in the situation.....	10.82	12.50
July ?—The advance discounts the underlying strength.....	12.02	13.40
August—Advance discounts underlying strength.....	12.19	13.15
September—A lower average price through the late fall and early winter than exists at present is indicated.....	11.50	12.40
October—A lower average price level should develop over the next few months.....	11.16	11.25
November—A lower average market should be witnessed over the next month or two.....	10.66	----
December—		

(1) Price Current Grain Reporter, November 4, 1925, page 35.

UNITED STATES DEPARTMENT OF AGRICULTURE—THE PRICE
SITUATION 1925
TABLE VIII

Wheat Forecast	Wheat Prices
January—On the pre-war level the farm price in February would be about 1.65.....	162.1
February—Price of wheat has passed the high point.....	169.8
March ?—Important factors have depressing influence upon prevailing price.....	164.0
April—Promise of some improvement in price.....	140.5
*May—Some decline not improbable.....	149.1
June ?—Average price slightly higher for season than last year.....	152.7
July ?—World price in a fairly high level compared with 1923.....	140.3
August ?—Higher prices than a year ago 114.2.....	150.4
September ?—Non-Committal.....	144.4
October ?—Non-Committal.....	136.4
November ?—Non-Committal.....	----
December—	

(Table XI). About half the time the reports are non-committal. A miss would be credited to July by most readers.

Other Forecasts

These three sets of forecasts give some idea of recent efforts at giving the farmer some more definite basis for his marketing program than he has time and equipment to work out for himself. A few other forecasts will be reviewed

UNITED STATES DEPARTMENT OF AGRICULTURE—THE PRICE SITUATION 1925

TABLE IX

Corn Forecast	Corn Prices
January—Price about consistent with the size of the crop-----	112.0
February—No appreciable increase in the price of corn within next few months-----	114.5
March—No basis for expecting appreciable increase in price of corn-----	112.1
April—Normal seasonal rise-----	103.8
May ?—Planting weather will have its usual influence upon the price-----	107.5
*June—Prospect for steady prices-----	111.0
*July—Non-Committal-----	104.4
August—Prices downward to end of year-----	106.5
September—Prices downward to end of year-----	98.8
October—Prices downward to end of year-----	83.0
November—Prices downward to end of year-----	---
December—	---

UNITED STATES DEPARTMENT OF AGRICULTURE—THE PRICE SITUATION 1925

TABLE X

Hog Forecast	Farm Price	Chicago Average
January—Continuance of upward swing in prices-----	9.31	10.40
February—Higher prices-----	9.62	11.05
*March—Present upward movement continue through summer-----	11.83	13.55
*April—Further decline small if any. Mid-summer or early fall higher than March-----	11.64	12.60
May—Prices have apparently reached bottom of the decline-----	10.78	12.10
June—Upward trend-----	10.82	12.50
July—Upward trend-----	12.02	13.40
*August—Upward trend-----	12.19	13.15
September—Downward trend-----	11.50	12.40
October—Downward trend-----	11.16	11.25
November—Downward trend-----	10.66	---
December—Downward trend-----	---	---

in less detail. The forecasts of a second commercial agency were reviewed. In the case of stocks and bonds this agency predicted very accurately until the spring of 1925. In its forecasts relating to agricultural products, however, this agency scored only 45 per cent accuracy or missed the price trend 55 per cent of the time. *Farm Economics*, published at Cornell University, has not issued forecasts at any regular intervals but has made quite a number of price predictions in the course of the last few years. In a period from March, 1923, to July, 1925, twenty-seven distinct forecasts have been made. In nine cases out of 27, the forecasts were erroneous. This gives an error of 33 1/3 per cent or a "clean hit" two-thirds of the time.

In the case of the Department of Agriculture's outlook reports, the batting average runs a little higher than that indicated in the afore-mentioned forecasts. The percentage, however, is figured on a different basis and the essential purpose of these forecasts is different from that of the other forecasts. The outlook reports are essentially forecasts for the purpose of giving aid in settling upon a production program. The forecasts previously discussed are, in the main, for the purpose of helping in the selection of a marketing program after production has already been completed and supplies are on hand. The outlook reports attempt to point

UNITED STATES DEPARTMENT OF AGRICULTURE—THE PRICE
SITUATION 1925

TABLE XI

Cattle Forecast	Cattle Price (*)
January—Marketings continue heavy during January-----	9.10
February—Appreciable increase in price after March 1-----	9.35
March—Prices remain above those of last year-----	10.20
April ?—Non-Committal -----	10.20
May ?—No forecast-----	10.05
June—Prices of grain-feds probably strengthen materially-----	10.75
*July—Higher prices (Inferred)-----	12.05
August ?—No forecast-----	12.05
September ?—Non-Committal-----	11.70
October ?—Non-Committal -----	-----
November—Non-Committal -----	-----
December—	-----

*Chicago average, Price Current Grain Reporter Oct. 21, 1925, page 31.

out, from a market or price standpoint, *what to produce*. The important measure of the value of such a forecast therefore is for how many commodities out of the total number the forecast is accurate. Measured in this way the United States Department of Agriculture 1924 outlook report shows a miss on one commodity out of seven or a percentage error of about 14 per cent, making a batting average of 86 per cent. Measured in the same way, the 1925 outlook report shows misses on two commodities out of 22 reported on, or a batting average of 92.

Forecasts to serve as the basis of marketing programs, on the other hand, must answer from the standpoint of prices the question, when to sell a given commodity. The important measure of the value of this kind of a forecast therefore is how frequently the forecast of seasonal trend for each commodity is correct. The two types of forecasts, therefore, are hardly comparable as to accuracy. Both have a distinct service to offer.

The relative accuracy of the grain futures market in forecasting future grain prices has been studied from several angles by the Federal Trade Commission. In its analysis of price leadership between cash and futures, the Commission points out that in the case of Kansas City wheat, where futures have changed their trend first, cash has followed in the same direction in 66.2³ per cent of the instances. Exactly the same percentage obtained in the case of Kansas City corn.⁴ St. Louis oats gave a percentage of 66.⁵ Chicago wheat showed a percentage of 68.8;⁶ Chicago corn 62.2⁷ per cent; Chicago oats 56⁸ per cent. In all these comparisons the basis is future "open to close" with cash "same day to next day." Even where future price changes precede cash price changes and may thus in a way forecast them, they are only accurate in about two-thirds of the instances.

This method, of course, is not a close measurement of the accuracy of the futures markets as forecasts of future cash prices. They are rather, as the Federal Trade Commission report uses them, indicators of the extent to which cash prices may follow the lead of futures. Because of the closeness in

³ *Report of the Federal Trade Commission on the Grain Trade Vol. VI, Prices of Grain and Grain Futures*, p. 296.

⁴ *Ibid.*, p. 297. ⁵ *Ibid.*, p. 298. ⁶ *Ibid.*, p. 280. ⁷ *Ibid.*, p. 281. ⁸ *Ibid.*, p. 281.

time of the cash price to the future in this comparison the element of prediction in the future price is no doubt obscured to a large degree by other factors. The Commission's comparison of the spread between cash price in April and the July and September option in April with the spread between cash prices in April and cash prices in the months of maturity is a better measure of the accuracy of futures as a forecast. In this case, the forecast is for a span of 3 to 5 months and takes into account amount of price change as well as direction of price change. The best accomplishment of the futures market for wheat on this basis was a 78 per cent hit. In this case, what is meant is that only 78 per cent of the real price change was anticipated. This figure is secured by averaging figures for 10 years and does not count individual hits or misses.

Percy Wallis and Albert Wallis, in *Prices and Wages*⁹ report their own experiences in forecasting cotton price trends. While they predict the season's average price closely in most years, their errors as to direction of trend from month to month are as great as those usually found. In brief, in 1910-11 they missed direction of trend based on monthly changes seven months out of twelve. In 1911-12, they missed only two months out of twelve; in 1912-13, five months out of twelve; in 1913-14, six months out of twelve; and 1914-15, four months out of twelve. This is on the basis of their own averages of actual cotton prices.

Perhaps no good purpose can be served by citing further instances of attempts to forecast prices in a way that might aid one in determining upon a marketing program. The remainder of this discussion can best be directed toward pointing out what possibilities there are for really accomplishing anything, some of the limitations to this work, some methods of approach that now seem necessary, and will only incidentally suggest something in regard to agricultural forecasts as a basis for the choice of production programs.

The possibility of really accomplishing anything through agricultural forecasts depends more upon whether it will be possible to get farmers, directors of experiment stations, ex-

⁹ P. S. King & Son, Ltd., Westminster, 1921.

tension directors, and others to take a reasonable view of the essential nature of such work rather than upon the possibility of working out methods. To illustrate, a Kansas hog feeder wrote the following to the Kansas State Agricultural College in August, 1925: "We would like to know the apparent trend of the hog and corn markets for the ensuing nine months as deduced from the records of past years. There is no doubt in our minds that your system of peeping at the future by poring over the records of the past is founded on common sense. Perhaps this is true because we have been pursuing a similar system but are handicapped by lack of time to secure the necessary data. We have about 2,800 hogs on hand now. About 1,000 of these will be for sale in September with an additional 300 in October, etc."

Now if it is possible to approach this problem somewhat in the unpretentious way outlined by this farmer, if workers in this field can understand that they are only trying to do a little better what good farmers laboring under handicaps have been trying to do for themselves, and if workers can leave the impression that their principal work is to remove the handicap under which the farmer has been working, then such a program can without doubt be made an acceptable one to all concerned. An extension man in marketing states that the difficulty in selling the idea of this service is not in getting farmers to appreciate it. The real job is in getting county agents, extension men in other lines, and scientific workers who have been used to measuring things with calipers, even to look at anything that may be as much as 25 per cent off when it comes to measurements.

*Limitations to Agricultural Forecasting for the Purpose of
Determining upon a Marketing Program.*

The essential tasks to be performed in the preparation of an agricultural forecast are (1) the preparation of certain numerical aspects of our problem in an intelligible form, (2) the drawing of inferences based as Keynes has said upon "experiment, analysis, comparison, and differentiation."¹⁰

¹⁰ *The Problem of Business Forecasting*, Persons, Foster, and Hettinger, p. 11.

Though the latter may involve—as it most frequently does—the consideration of numerical data, it requires scope of data rather than continuity of data. In brief, the first task is essentially analytical in its methods, while the second is principally synthetic. The first effort, as in multiple correlation, is to determine the effect of a certain factor when others are held constant, then to determine the effect of another factor while the remaining factors are held constant, and so on. The second effort is to judge the resulting effect of a combination of all these factors in such proportions as they were perhaps never combined in before. For instance, the present situation with respect to world's crop of wheat and United States crop has not been exactly paralleled in any year since 1896. This year there is, it seems, an increase in world's crop of 8 to 10 per cent over last year, but approximately a 20 per cent decrease in the size of the United States crop. About the closest approach to the present United States situation was in 1899, when there was an 18 per cent decrease in crop. However, in that year the world's crop also decreased to the extent of 25 per cent and it can hardly be said that the financial situation and general business conditions at present are similar to those in 1899.

It seems that any agricultural forecast that might serve as a basis for a marketing program will have to emphasize the preponderance of its reliance upon the second element in the making of a forecast. On the other hand, an agricultural forecast intended to serve as the basis for a production program can for several reasons rely more fully upon the first named procedure in making a forecast. In the first place, there will be a certain averaging effect from the short period price reactions. Because of the greater span of time, there will be fewer factors that will maintain a continuous effect throughout the period. A case in point is that of the forecast of high hog prices in September by the United States Department of Agriculture and several other agencies. Most statistical analyses pointed to this conclusion. The United States Department of Agriculture forecast appeared in the *July Monthly Supplement of Crops and Markets* suggesting

a September price for heavy hogs at Chicago above \$16.00 compared with a March price a little below \$14.00. No such September price was realized and perhaps one contributing reason was that too many farmers believed it would be.

In planning a marketing program, however, evidences of changes in conditions must be sought. The case of the Kansas hogman referred to above illustrates the practical aspects of such a problem. This farmer you will recall had about 1,000 hogs that he had prepared for the September market and wrote the college as has been indicated. Summarizing the information furnished him, the following suggestions were made on August 24, 1925: "We believe the present situation indicates a good market for light hogs, in particular, the next two or three weeks and probably no marked weakness in the market until after the middle of October unless shippers get panicky for a short time." Prices at Kansas City did break during the first ten days of September but the situation had been reasoned out about as follows: The outlook for September has been strong. However, it is noticeable that, while the Missouri and Kansas 1924 fall pig crops were about 71 per cent of the year before, April receipts ran proportionately lighter than the year before and May receipts were only about in line with expectations. This resulted in a bigger proportionate run in June. Likewise July receipts ran under expectations and August was running just about in line with expectations. This, together with similar trends in other markets suggested a possible crowding in the September movement. It did not seem likely that, with high prices for old corn and with prospects for cheaper new corn, the movement of the 1925 spring pig crop would crowd the market for any considerable time before the middle of October. This being the case, the Kansas farmer could hardly lose any more by holding until later in September. This he did and it was some relief, of course, when a letter was received containing the following statement: "We received your special market forecast. I take this opportunity to thank you for coming to our assistance. I might say that our courage needed a little tonic along about the middle of September, for we had nearly a thousand good hogs ready

for market and the market going from bad to worse. To make a long tale short, we got rid of them the one good week of the month at \$13.00 here." This instance is cited merely to point out that in working out a marketing program it is necessary from time to time to modify the longer time forecasts resulting from more detailed and more complicated statistical analysis.

This suggests that one limitation to the development of this kind of marketing service may be lack of scope in the marketing studies that have so far been made. Furthermore, it suggests the necessity of more specialization in marketing work, even possibly to the extent of making marketing work in agricultural colleges coordinate with production work at least in respect to the degree of specialization. Furthermore, in attempting to apply strictly scientific methods to economic problems such as this, workers will naturally be very reluctant about saying anything that may later necessitate the admission of a mistake. Almost unconsciously they work toward an end such that so far as this kind of work is concerned, it can truthfully be said of one of them, "he never said a foolish thing nor ever did a wise one." In so strenuously trying to avoid the first fate workers run headlong into the latter.

Price Influences Within Restricted Market Areas

The May forecast for wheat in the 1925 *Kansas Agricultural Situation* illustrates how the accuracy of a forecast can be called to question by divergent local influences. The question as to whether this forecast was a hit or a miss hinged upon whether the forecast applied to low quality No. 2 wheat or to high quality milling wheat of No. 2 grade. The former decreased in price about three cents a bushel as the prediction indicated but the premium for the latter type of wheat rose so rapidly that it resulted in a higher market for the best No. 2 wheat.

The effect of this line of influence within local market areas is well illustrated by a price situation on the Kansas City market in the spring of 1924 as compared with 1923. The

Kansas wheat crop of 1922 was approximately 122 million bushels. About 37 million bushels of this was No. 4 and lower, leaving 85 million bushels above No. 4 grade. Though part of the higher grades were low protein wheat, through mixing operations the Kansas and Kansas City mills, which grind about 70 million bushels of wheat, had a very good margin of supply of quality wheat. On the first trading day of May 1923, cash No. 2 hard winter wheat was quoted on the Kansas City market \$1.14 to \$1.21 or with a range of seven cents. On the last day of May, the price was \$1.10 to \$1.19 or a nine cent range. The 1922 world's crop was estimated at 3,345,362,000 bushels. Now compare this with the situation the next year. The Kansas crop was 83 million bushels. About 24 million bushels was No. 4 grade or lower, leaving 59 million bushels above this grade. This meant a relative scarcity of quality wheat for southwestern mills. World's wheat crop for 1923 was 3,409,041,000 bushels. In May, 1924, however, the price for No. 2 hard winter wheat at Kansas City was quoted the first of May \$0.98 to \$1.21 a bushel, a range of 23 cents a bushel. The last of May the price was \$1.01 to \$1.16 a bushel, giving a range of 15 cents a bushel.

The point is this; bottom No. 2 wheat quoted at 98 cents compared with \$1.14 the year before was in line with what was to be expected from the comparative size of the world's wheat crop for the two years. The \$1.21 a bushel quotation for top No. 2, the same price as the year before, resulting in a price range within the grade of 23 cents compared with seven cents the year before, is accounted for only by the local situation within the Kansas City market area.

Were we studying markets from the standpoint of speculating in futures, there would be little need for considering these local factors. The futures market is much more of a unit. Price relationships between markets are not subject to the friction that exists in the cash market. However, since the purpose of these agricultural forecasts is to serve the farmer as a basis for determining upon a marketing program, these local influences loom up as frequently important considerations.

Even more restricted local influences may sometimes be of

importance. There are, for instance, about 11 Kansas counties whose mills grind more wheat than the counties produce. These counties are important importing areas for the wheat of neighboring counties. Any heavy movement of local wheat out of these areas in the fall, especially if the local crop were light, could result in local prices the next spring on a Kansas City plus price basis rather than on the Kansas City minus basis that prevailed in the fall. This furnishes a restricted local market that would pay farmers for storing their wheat while in other sections the general situation does not justify a rise worth holding for. This all suggests the necessity for making more extensive studies of local influences affecting cash prices as additional bases for working out marketing programs that will articulate with the varying conditions under which farmers have to work.

Effectiveness of Forecasts

Furthermore, after evaluating all these considerations it must be recognized that the number of times forecasts hit or miss on paper is after all an inadequate measure of the effectiveness of the forecasts. Forecasts at certain seasons of the year, as for instance in June or July, September or October, January or May, in the case of wheat may, if they are at all effective, affect the actions of more farmers than an equally accurate paper forecast at some other time.

Perhaps the strongest challenge of all that this kind of work will have to meet in educational institutions is the question, "has such work any real educational value?" There is a strong feeling in some quarters that in the whole field of descriptive economics there is already too much danger of following details and never reaching generalizations, such as characterize scientific research. The danger is unduly magnified by the disposition to consider economic generalizations as analogous to scientific generalizations. Frequently they do not come in the same category of usefulness at all. In science, the details out of which an important generalization is built are inconsequential compared with the generalization

once it is established. In business, the details may be more important than the generalization. For instance, in the case of wheat we may quite properly generalize that the price of wheat is made in Liverpool. We can conduct a discussion or a debate on the basis of that generalization but there are few places, if any, in the United States where we could successfully conduct a grain business on that basis. It is out of the details that men make a living and it is with this very thing that we are very much concerned in economics.

After all is said and done, the idea of service involved in agricultural forecasting will at least have this healthful influence on some of our economic thinking. It will lead us further away from the attitude so characteristic of that famous volume in Don Quixote's library of which it was said, "it intends and propounds somewhat but concludes nothing."

THE AGRICULTURAL SURPLUS ¹

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What is a surplus? It is of no avail to consult the dictionary for a further or deeper understanding of the word surplus, in the hope of getting light beyond that gained through popular discussion. This is nothing more nor less than a recognition of the fact that it is not the literal meaning of the word which occasions the difficulty. It is rather the interpretation, the setting of the question. A surplus in the treasury means money not needed for regular expenditures already voted. Surplus rainfall means an amount above normal. Surplus fat is an excess, but the right amount is often a matter of opinion. Surplus grain is an amount in excess, but in excess of what?

I. A Surplus as Popularly Understood

There are three important popular views of the surplus. First, there are those who hold that there is not now and never has been a surplus of staple products such as wheat, beef, pork, or cotton. The second group believes there will soon be no surplus. The third of these groups holds a view different in character. Instead of predicating the existence of a surplus on the facts of consumption as related to a given supply, it, in measuring a surplus or deficit, holds that quantity of production must be balanced against needs. The first of these doctrinaires, those who believe there is no surplus, are found in colleges, in Congress, and in editorial offices. They apply a test which is infallible, as they view it, to each and every case. *Is the produce consumed?* If the answer to the question is an affirmative there can be no doubt in their minds that there is no surplus. This would imply that a surplus could mean merely a quantity of goods for which no demand exists and which in consequence must go to waste. These people would admit that there

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 28, 1925.

had been at times a surplus of potatoes, of vegetables, and of certain kinds of perishable fruits, since some of these commodities have on many occasions gone to waste. But they find that wheat is seldom wasted outright; somebody, at some price, ultimately buys it, furnishing *prima facie* evidence that no surplus existed. The same is true of most of our meat products. They are all sold. Cotton is an excellent example for the advocates of the no-surplus cult. It will last unspun and unwoven for many years. Eventually a buyer takes it and the seller gets a price. Again the surplus myth has been exploded.

The second phase of the no-surplus contention is found in a form which appeals to a much larger number of partisans. The claim is made that, although there may now be a surplus, the time is just about to arrive when this difficulty will disappear, perhaps permanently, and the producer through the development of a scarcity come into his own. They can see, as they think, the time rapidly approaching when food stuff and other agricultural produce will be available in much smaller quantities per capita than at present. The scarcity will naturally cause a rise in price, and the relative position of the farmer will be automatically improved. This is a sort of harmony of interests doctrine, a brand of optimism carrying a fair percentage of abstract, ultimate truth but lacking definite or immediate applicability. We have been told for at least a quarter century that we were just on the heels of scarcity and that a very short time only would elapse until the farmer would become the favored class in the market place. This may be true in terms of centuries, but so far as human lives are concerned they are too short to find consolation in the prospect of a material change in the proportion of agricultural produce to population. As a matter of fact, the decrease of production in proportion to population would fall far short of curing the surplus disease. It could still break out from year to year and cause endless distress.

From the third point of view, a dietetic concept, it is not a difficult undertaking to show that from the standpoint of 112,000,000 people no surplus of food and clothing stuff exists

since a certain percentage of the population is always in want. The claim is made that what is needed is not some means of preventing production, but rather a plan whereby the goods produced may be earned and procured by those who are ill supplied. To this doctrine we all agree or at least offer no objection. To carry it out is not an easy matter; at least no feasible, easily applicable plan for doing it meets with general approval. We still use as symbols such terms as The East End, the Cow Gate, Bleeker Street, and South Halsted Street. How to get our agricultural surpluses to these quarters and at the same time bring back a *quid pro quo* out of which to realize cost of production plus a reasonable profit is an economic conundrum not found in the published writings of General Booth, Jane Addams, or Jacob Riis. The question of the surplus may well be considered at the right time and place in the light of the feeding of the whole populace, but at present it has to be put, in Lowell's words, "on the low Yankee standard of dollars and cents." Society as a whole should strive to keep itself healthy and see to it, to that end, that among other things its members are well fed. During the period intervening between the present and the consummation of the ideal farmers will look for material returns for their produce and will feel the reality of a surplus whenever they have a sufficient quantity to cause a fall in price.

II. An Economic Definition of Surplus

Rejecting then these views of a surplus as either wrong or too idealistic we are driven to the economic concept and to the interpretation which fits the psychology and the business experience of the parties concerned. A surplus considered from the standpoint of a market may, indeed must, be viewed, first, as a quantity above normal or, second, as a quantity available for export or, third, as a quantity so abundant as to depress prices below a figure which will adequately reward the producer, whether or not it is below normal and whether or not any portion is exported.

A normal supply from the standpoint of the producer may at times be viewed as abnormal from the standpoint of profit.

That is to say, a normal supply may include a surplus. For instance, the world supply of wheat from 1875 to 1900 was no doubt normal enough, but as measured by dietary habits and purchasing power there was a surplus. Thus a normal surplus, that is to say an over-abundant supply, produced the conditions resulting in low prices. During this period the English farmers were ruined, while those responsible for the calamity were themselves far from prosperous. It was a disease propagated and spread by its own ravages. The more wheat the western prairie farmer produced, the more he must produce. The production of more was, as the farmer saw it, the only hope of making up past losses and the only hope of an adequate income. The fact is that the wisest philosopher knew no way out of the dilemma. It was a dilemma which should not have existed, but which a weak government and a powerful pioneer together with abundant unused land inevitably produced. It could not have been prevented, and under similar conditions, could they exist, would not be prevented now. A surplus often means that the goods in question have to be used for a lower, less remunerative purpose than the usual. For instance, when we have a superabundant wheat crop an appreciable amount of it is fed to livestock. This means that it competes against barley and corn on a feed, not a food, basis. Corn in 1921 was used in a limited way for fuel, thus competing at the lower margin of use against wood and coal, commodities usually worth much less than corn per ton.

More narrowly, and more visibly, the surplus idea is linked with the facts of exportation. Whatever goods are sold to buyers of other nations unmistakably constitute a surplus in some tangible sense. It may not be in the best sense. India may export wheat while millions of her people are starving. The amount exported is undoubtedly a surplus, but it is a surplus over the quantity salable at home at the export price. Measures have been taken politically to prevent this anomaly from happening.

From the United States there is an exportable surplus of wheat varying from 8 per cent in 1904 to 37 per cent in 1914. The occasion for the wide variation is mainly the variation

in the total amount of crop produced. Another cause of variation is the demand abroad, manifesting itself in different price levels. With a high world price more will be exported from a given country than with a low price. Thus during the war we exported not only more but more in proportion to the size of crops, leaving ourselves less for home consumption. In other words, the surplus measured in terms of exports increases with the increase in the price offered and decreases with the falling of world prices. In the former case he is worse off. A pork surplus is reckoned in terms of exports as a rule, since we export some 12 or 14 per cent of the entire amount produced and, moreover, always have enough for export to keep the foreign demand prominently in mind. With cotton a different situation obtains. So much more is produced than is wanted by home mills that the exportation of 50 or 60 per cent is viewed as perfectly normal. The result is that cotton is recognized as a world crop and therefore a world price is the only one considered.

While the exportable surplus is so often feared as the millstone about the producer's neck, dragging him hopelessly down, it should not be forgotten that just as bad surpluses occur with no appreciable exports of the excess quantities. Perhaps the best example of this kind is that of the production and price of potatoes. It takes about $3\frac{1}{2}$ bushels per capita to satisfy the appetite for potatoes without fear of a shortage. A half bushel more than that seems to assure everyone that there is an abundance and as a result the price is low, while a little less than the $3\frac{1}{2}$ bushels sends prices soaring. For instance, the crop of 1924 was abundant, 20 per cent above normal (the average for 1914-1920), and the December farm price was 64 cents a bushel. The 1925 crop is about 25 per cent less in amount, and the price is 200 per cent greater. In fact the December price in Chicago in 1924 was just about a cent a pound, while the December price of 1925 is nearly four cents a pound—an increase of 300 per cent. Last year there was a surplus, yet the quantity was substantially all used, and used at home, there being no exports worthy of mention. The surplus of last year, therefore, did not mean a quantity we could not use (though some was used for feed)

or a quantity dependent upon the bidding of foreigners. It simply meant enough to depress the price below the normal or in other words a price which failed to reward the producer adequately. It neither pleased him nor paid his expenses. This year the producer of potatoes in Idaho receives, gross, \$500 or even \$1,000 from an acre of potatoes. Last year not all of them were dug since it was doubtful that they were worth it.

A home surplus independent of export is just as well illustrated by such products as raisins. In 1920 the western wholesale price of raisins was three times as high as in 1924. The production had doubled; the price was down 65 per cent.

A surplus may be world-wide in scope, as with cotton or wheat. It may be national as in the case of potatoes or corn. It may be local as with hay in Idaho, cabbage in Texas, or cherries in Wisconsin. Better transportation facilities and means for caring for the product tend to make local surplus of less and less importance. We may can the cherries and reduce the freight rates on hay.

III. A Surplus of Manufactured Goods

In contrast with the agricultural surplus we may turn our attention for a few minutes to the surplus in the manufacturing world. Many times attention is called to the supposed fact that manufacturers do not allow surplus production to wreck them. Of very many manufacturers this is true although many manufacturers are wrecked nevertheless. A manufacturer can cut down on his production whenever it appears that to continue producing would result in a loss. True it may mean a loss to cut down, but he has the choice and undertakes to choose the lesser. The farmer to a much smaller degree has the choice. He cannot cut the production of milk 50 per cent in order to meet an emergency; the shoe factory operator may. The farmer cannot cut his acreage in half because prices fall, at least not after the planting season is past. The coal operator can reduce his output 50 per cent within any given month if to run means a loss on all coal brought to the surface.

It has been pointed out that the United States Steel Corporation never allows a surplus to become a formidable menace to profits. The choice of this company as an illustration is a particularly good one in proving the point at issue so long as but one side of the question is presented. The United States Steel Corporation undoubtedly is in a position to protect itself against the disaster of an overproduction. It is the one big company in the field. Whether or not it has a monopoly or, to put it better, whatever degree of monopoly it enjoys, it can curtail production with very little loss. There is no harvest period at the mines demanding that the crop be saved in order to salvage at least a fraction of former expenditures. Laborers may be laid off by the thousand and the company is not required to pay doles to tide the laborer and his family over the period of wage suspension. The stock on hand, such as steel rails and I-beams, will not spoil because of delay in their sale or use. They may even be, indeed are, stacked up in the open, and damage from the weather during a year is not serious. Thus the surplus will automatically disappear.

Three characteristics of the steel business make the procedure above outlined unlike that of farming. First, operations may be stopped at any moment without entailing enormous loss on previous operations such as stopping the output of a dairy or failing to harvest cotton after it is grown. Secondly, the surplus supply of most manufactured goods may be stored with little loss, in contrast with the perishability of most agricultural output such as livestock and its products, fruits, vegetables, and to a lesser extent cereals. Thirdly, the manufacturer can shunt the loss onto the laborers to a great extent. That is, he can lessen his outgo by ceasing wage payments. The farmer can not discharge his own family, since by doing so he would still have their bills to pay, the income being all he can voluntarily cut off. Thus the farmer can better take a 50 per cent income than none at all. He is neither in a position to strike like the laborer nor to stop producing like the manufacturer.

It is largely a question relating to the competition to which the two classes are subjected. The farmer must meet constant and merciless competition. It is well known that com-

petition is not keen and effective to the last farthing in such businesses as the United States Steel Company, the National Biscuit Company, the Ford Motor Company, the anthracite coal companies, the copper companies, the Standard Oil, the Western Union, or the many railway companies. And in naming these we have named the representatives of a considerable part of the wealth of the country. The ability to escape the ravages of competition is due, first, to natural advantages and mass of capital, secondly to tariff protection. We are committed to the tariff. It is heresy to utter a word in criticism of it or to point out facts in connection with it. We have the tariff, and the farmers are paying for it in terms of dear manufactured articles and the resulting high wages and doing it out of an income hardly above the pre-war level. The government is acting the part of the umpire who makes the tenth man for the losing team to play against. Many a baseball team could stand the added opposition of a tenth man if put in the outer field or the infield, but to play against the regular nine plus the umpire is too much for the best performers. Or, to change the figure, the tariff is the joker and is regularly found in the hands of the opponent sitting across the table from the farmer, giving a measure of advantage hard to overcome.

IV. Can a Surplus Be Prevented?

In contrast with the control of the output in order to avoid a surplus, difficult in many manufacturing lines but feasible in many important instances, agriculture cannot hope to save itself by similar means. A further illustration may help to make this truth clearer. For some years agriculture was advised to produce for the home market only. Had there been a reasonable means of putting the advice into practice, which there was not so far as mere acreages were concerned, what would the result have been? The 1919 corn acreage was 7.5 per cent below that of 1918, while the yield was 12.5 per cent above. The crop of 1924 was 20 per cent less than that of 1923, yet it grew on an area a million acres greater. The Chicago December high price of the smaller crop was

135.5 cents, while that of the bigger crop was 87 cents. Thus the small crop was worth 55 per cent more per unit than the big one. Discouraged with the low price of wheat in 1923, the growers grew in 1924 an acreage smaller by 9 per cent than the preceding. The aggregate yield was, however, 15 per cent greater. Fortunately a world shortage helped us out and the big crop brought a big price—a coincident about as frequent as a blue moon. Let us then vote for the smaller crop. No doubt it would be more in keeping with the situation to pray for it since the surplus portion is manifestly the Lord's affair more than man's.

To prevent over-production seems well nigh impossible so far as crops are concerned. In the livestock field more can be done to adjust supply to demand. For instance, if the published figures are correct farmers are missing a good opportunity to be on hand with a supply of draft horses in 1930. This year they were on hand with an under-supply of hogs, yet the hog is so vitally connected with the corn crop that a larger number would have been even more to their disadvantage. In fact the present ratio between hogs and corn is a favorable one to the farmer. But, however explained, a surplus of corn and its products is a reality at the present moment.

V. Surpluses Will Continue to Occur

That a surplus of agricultural products is bound to occur at least half the time and probably much more than half the time during the next twenty-five years, is so patent as hardly to need demonstration or explanation. We are destined to have more food and more cotton fifteen to twenty years out of the next quarter century than consumers will take at a price satisfactory to the farmer or at a price which should be satisfactory to the farmer, unless some very improbable things happen to prevent it. Another world war would put food at a premium, a government subsidy might bring relief, a revision of the tariff downward would do likewise. Two of these remedies would be worse than the disease; the third measure would be a miracle. Or, let us recognize the possibil-

ity of a real revision of the tariff in the interest of the farmer and certain groups of consumers. The farmers constitute about thirty per cent of the population. Every year the percentage grows smaller. Our bi-party cleavage is a powerful factor. The interests of the farmers of the West and the South are far from identical. Their party allegiance is unlike. These are real obstacles to overcome in a tariff campaign. It is time that some thinking be done in preparation for a struggle in which the farmers' interest in the tariff may be made effective. The longer it is postponed the harder it will be.

If we are to have a surplus, at least one year in two, what shall we do with it? A few hot heads win applause by suggesting that we destroy it. This suggestion merits no discussion. It remains then to handle it, but how? The suggestions are mainly two, with a third which thus far has few supporters. First, it is proposed by a very large number of enthusiasts that the government be invoked to take the surplus off the farmers' hands. Time will not permit an elaboration of this proposal. It has had the sanction of men high in the administrative work of the government, of a large minority of congressmen, and of leading agricultural papers. It will be a political issue during the present session of Congress. It has won the support of almost no economists. Should it succeed it will mean the triumph of a phase of price-fixing such as has virtually never been known except during the stress of war. There are a few farmer friends who have the courage to suggest outright the desirability of a price-fixing plan whereby a price covering cost of production and a profit should be named annually. This is the plan of an ex-Secretary of Agriculture. Since there seems to be nothing complimentary to be said in this connection it is no doubt best to say nothing at all.

The second, semi-popular proposal is that the cooperatives, through federation, should undertake to hold the surplus over from a year of excess to one of deficit. This means that they will undertake to do for a period of years the same thing respecting annual surpluses which several cooperatives are already doing in taking care of the sea-

sonal surplus, i. e. distributing it so as to avoid the depression due to marketing too rapidly after harvest or during the period of greatest production. The desirability and the success of the program by which seasonal surpluses are handled is not to be questioned. Carrying the surplus of the years of abundance over to the years of relative scarcity is, however, a very different matter. It seems that $2\frac{1}{2}$ billion bushels of corn is likely to be worth about the same number of dollars, whereas 3 billion bushels is worth not over two-thirds to three-quarters as much. Suppose 10 or 12 per cent of the 1921 crop had been withheld from market. The result might easily have been an increase in the aggregate selling value by some half billion dollars. The 350,000,000 bushels taken off the market would, however, have made, added to the 3 billion bushel crop of 1923, the greatest surplus of corn ever known. It would have been necessary to withdraw from the crop of that year 500,000,000 bushels, making in storage 850,000,000 bushels or a third of a crop. But again the $2\frac{1}{2}$ billion put upon the market would have brought in cash \$300,000,000 more than did the full amount grown. Had the accumulated surplus of the years 1922 and 1923 been put on sale in 1924 the \$1.00 a bushel would have been reduced to 50 or 60 cents, and surely no one would want a surplus of preceding years added to the 1925 crop.

In other words, there will never come a time when it will seem desirable to throw the surplus back into our own market, since this means levelling down as well as levelling up. Should it ever be feasible to hold produce over from one year to another in the hope of a higher price, it will be necessary to bring everybody into the arrangement. Otherwise the poolers will be left holding the sack—a full one true enough—but withholding the contents from the market while the non-pooler sells at an augmented price. To handle a surplus by holding for a period of years—and it has been tried—requires a membership including all important producers, a system of financing including the advancement of money running into vast sums, and a policy by which the surplus may be disposed of to the satisfaction of the pro-

ducers. The raisin growers view a surplus running beyond a succeeding harvest as a calamity. The prune growers hold the same view. One tobacco cooperative has recently gone to pieces, wrecked by a surplus; another one is looking earnestly for a way out of serious trouble of like kind. Whatever may be the difficulties of withholding a quantity of goods from a market, it is much easier than finding a market for them later. Cooperative companies may be wonderfully effective in selling produce. They are not so sure to succeed in the rôle of the speculator. In order to do so, even measurably well, they must approach monopoly control, and such control must include not merely the disposal of the major part of the product on hand, but should also manifest itself in a control of output.

A remedy for the surplus ills not yet tried may eventually prove effective, viz, some sort of insurance. No company of the present day would dare undertake the responsibility of insuring the farmers as a whole against low prices. It may be that a minority could be so insured.

Every now and then, even from the highest political stations, comes the cheering announcement to the farmer that his ills are being taken care of by the growth of population and the limitation of the land supply. This may be true, but there is opportunity for an endless amount of grief and bankruptcy before the happy balanced is reached. To sit patiently waiting for nature to make the adjustment, conceding if you please that she is doing it, is like waiting for all the water to pass under the bridge or for a glacier to come down a mountain side. It is cold comfort to tell the farmer that increase in population will create a market for his excess product.

VI. What May Be Done With Surpluses or to Lessen Their Influence?

In some way the creation of a disastrous surplus should be prevented or, if not wholly prevented, at least lessened.

The way to do it may not be clear but it must be found. Probably it will prove to be not a way but a group of ways or means.

Prominent among the programs that offer relief is one, long neglected, which would bring under social control the utilization of the land resources of the country. This does not mean a violent revolution. Quite the contrary. The bulk of the farm lands would be left as it now is in private hands, the owners using it as they see fit. It would mean that the best thought available would be used in determining the purpose and end to be served by the lands of the country which are on the doubtful list. Prominent among such lands, embracing hundreds of millions of acres, are those which once bore forests, and which now are of doubtful value as arable land. Many millions of acres should as speedily as possible be put back into forest, for while corn is distressingly cheap, lumber is correspondingly dear. Still we insist on destroying the forest and its prospect in order to grow more corn to add to the surplus. Here are problems which can not safely be left to the whims and ambitions of individual adventurers. About the same may be said of the great stretches of grazing land. Shall good, though cheap, grazing land be sacrificed in the vain attempt to grow more wheat where it will not grow advantageously, contributing to a surplus which makes us poorer not richer? Farmers would be more prosperous and the people in general better off with more grazing and less farming in the semi-arid regions.

Again farmers must learn to study price cycles and plan their operations in terms of five or ten year periods. Not all can be taught to do this, but an intelligent 25 per cent pulling in the opposite direction from that of the crowd would exert a salutary influence. Farmers should be well enough educated and ready to take advantage of all available opportunities. If they can do better at some other occupation, they should enter it in spite of widespread sentiment to the contrary. They should not leave farming because of bankruptcy but because of opportunity. With a free flow of labor and employment from farming to other industries, and back if necessary, a balance such as we have not recently known may be restored.

The perfection of the workings of cooperative companies especially in their efforts to distribute seasonal surpluses will result in the virtual disappearance of many formidable surpluses altogether. Moreover, through these cooperative companies information may be diffused, prospects studied, and plans made giving agriculture a chance to take its place alongside of the industries with respect to stability and prosperity.

A very simple, and fairly safe, way to meet the emergencies due to low prices of farm products during the past few years would be the payment of a moderate export bounty on certain designated products. It happens that about a third of the \$450,000,000 received as duties on imports is paid on agricultural products, mainly on sugar and wool. Should this sum or a little more, say \$250,000,000, be set aside to be used under the direction of a federal board, for the payment of bounties it would have a salutary effect on the prices of agriculture. At the same time it would be necessary for the farmers to bring their production under control to some real extent or the advantage of the bounties would be nullified through increased production. Should the bounties, where feasible, be paid to cooperative companies on exports made by themselves it would encourage the organization of such companies and work as an advantage to all concerned. Eventually the cooperatives should be able to handle the surplus successfully without government aid. A bounty, as here proposed, would be a logical counterpart of the tariff, and in the interest of the farmer some tariff modification is eminently desirable.

The farmer must raise his standard of life, we all agree. Must more income precede or must it follow? Are spiritual forces the outgrowth of the material or do spiritual forces precede or do they dominate? They are interlaced, interwoven. Which is important, warp or woof?

Last, but not least, agriculture cannot be asked to pay the bills of protectionism and remain as now outside its shelter.*

*A definition of a surplus submitted by a committee of the American Association of Land Grant Colleges and Experiment Stations in connection with Purnell projects is as follows: "A surplus is a supply in excess of the quantity which can be sold at a sufficient price to induce farmers to produce that quantity." The committee consists of G. F. Warren, B. H. Hibbard and W. E. Grimes.

WHAT COOPERATIVES DESIRE FROM WORKERS IN FARM MANAGEMENT AND MARKETING ¹

FRANK APP

CONSULTING AGRICULTURAL ECONOMIST

For the purpose of this discussion cooperatives should be divided into three classes: (1) those that feel they are self sufficient unto themselves and look with disfavor or distrust upon institutional workers, (2) those that desire to enlist the aid of institutional workers as promoters in expanding or advancing the association, such promotion to be based upon or masquerading under the name "cooperation" instead of the soundness of the movement or the operation and results of the association, and (3) those that always welcome further information pertaining to the distribution of the commodity in question, such information to be obtained from two sources —(a) experience, (b) investigation or research. The above classification would have aptly applied to many individuals whom the extension and agricultural college worker met in the early development of the agricultural college activities. Since cooperative associations are managed by individuals, they are subject to all the idiosyncrasies of the human personnel. Suffice it to say, however, that the past experience and training of the individual who serves as manager dominates or determines the attitude and policy of the association as represented by the above classification.

Fortunately, many associations have surrounded themselves with a management personnel that was drawn from our agricultural colleges. Management with an agricultural college training as a foundation, later tempered and balanced by commercial experience, is a strong asset and usually furnishes the association with an open-minded, progressive policy of operation. I take the liberty of mentioning the above so as to indicate more clearly that what a cooperative desires and what it needs may be diametrically opposed. The desire may be dictated by the personal or semi-political equation rather than the economics of the situation. Time is a wonder-

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 28, 1925.

ful ameliorator and worker of changes. The first class of cooperatives is gradually becoming less numerous because they discover their needs, the second class are semi-political or cooperative in form only and usually undergo a change in management or go the way of unsuccessful business corporations, while the third are making more demands on the farm management and market workers than they are prepared to supply.

Proper contacts and approach will usually change the first class cooperative into the third. The writer recalls very vividly the approach to a large regional cooperative of the first class. Through persistence and persuasion the officers reluctantly agreed to an investigational problem of direct application to their association. Before its completion almost the entire personnel became actively interested in obtaining data and furthering the work. The results were published and distributed by the association throughout its membership. The time to begin research for a cooperative is before it is organized. Many disastrous cooperative ventures would be avoided if the proper information were made available before they were organized or operated. At this time the analytical mind of the investigator will raise many questions pertinent to the organization that can be answered only through research or investigation. During this period there is always danger that the research worker may not be tolerant of the farm leader's desires or ideas and may in that way weaken his influence with the movement. The research mind allows no compromise. Organized effort must react through the individual; this frequently calls for compromise. Research is an aid to sound management but cannot replace management.

After an organization has begun to function there are two classes or two types of research necessary. The first type is very similar to that of the early work done in farm management, when the economic farm unit, farm balance, production, man labor, and other factors were studied. What is the economic cooperative unit? What is the personnel necessary to operate such a unit properly? What is the cost per unit of product handled? What is the necessary equipment? What system of accounting should

be installed? What is the best method of financing? Pooling? What kind of field service is necessary? These and many other factors should be more clearly isolated and made available to the associations. Such information would curb the tendency to spend or burden the cooperative with overhead and make undue expansion. This class or type of research then has to do with the efficiency of operation.

The second class or type of research has to do with the commodity itself. Commodities that are marketed in the finished form such as apples, peaches, watermelons, cranberries, citrus fruits, onions, potatoes, strawberries, and nuts need business research more than some commodity such as wheat, cotton, or livestock that is sold to the manufacturer. In the first instance the cooperative follows its product to the consumer, whereas in the latter only to the manufacturer. Should the cooperative enter the manufacturing field, then its problem is more complicated. The cooperatives that have done notable research work are largely of the former class; the cranberry growers and the citrus fruit growers are good examples of cooperatives using research as a basis of successful development. Market surveys showing the consumer preference including quality and pack, competition of other commodities or the same commodity from a different area, type of production, sales expansion, and racial custom are vital problems.

Price is a big factor in the distribution of perishables. New York will buy strawberries at any season of the year, regardless of price, but the small urban center waits until they can be retailed for about twenty-five cents a quart before buying. Price too has a direct bearing upon grade and pack. The most rigid economies must be followed on a low-priced market. This militates against fancy quality and pack. The writer is familiar with an instance where a large asparagus grower changed his type of pack and grade so as to command almost \$2.00 per crate more than his former pack on the New York market. This difference in price eliminated him from all his former markets outside of New York for this fancy grade. The supply, demand and competition are ever important factors to the cooperative. The Bureau of Agricultural Economics is performing a fine service through its "Intentions

to Plant Surveys" and its "Consumer Studies." Some commodities require more detailed information pertaining to varieties, time of harvest, place distribution, and consumer demand.

Peaches furnish a good illustration of research needs. The crop fluctuates in production wildly, it is highly perishable, and those from the South are a long distance from market. The Georgia peach crop for 1924 glutted all the markets. It could not find new markets to buy their increased crop. About 13,000 cars were shipped and the balance allowed to drop to the ground. The crop is moved in June and July, with about seventy-five per cent during July. During the season these peaches competed with Arkansas peaches, Carolina peaches, Virginia peaches, as well as 17,000 cars of cantaloupes from California and 20,800 cars of watermelons from Georgia and Florida. The first Georgia peaches brought \$7.50 a crate in New York. That brought heavy shipments, breaking the price to \$2.00 and less. One day 200 cars arrived, of which 60 were not wanted. The next heavy peach movement comes from North Carolina. So long as Georgia shipped, the Carolina market was glutted. New Jersey overlaps with Carolina and New York. The heavy planting in Georgia hurt both the Georgia and Carolina owner. The heavy planting in Carolina severely hurt the New Jersey grower. Until North Carolina became a heavy yellow peach shipper, New Jersey could profitably produce early white and late yellow peaches. The yellow peach from Carolina successfully competes with Jersey white peaches regardless of haul or quality. This expansion in Carolina has proved a hardship on the New Jersey grower. In 1920 New Jersey had 1,936,632 bearing peach trees and 884,067 non-bearing. Approximately two-thirds of these were white varieties. Since 1922, many of these white varieties have been pulled out because the yellow peach from Carolina has made them unprofitable. Had the New Jersey grower known earlier what the Carolina grower was planting, this loss and hardship could have been avoided.

Here is a concrete illustration where the farm management worker was needed. The problem is regional, not local. This production program could have been changed with far less

loss if the grower had had the advantage of information obtainable through research. Each commodity should be analyzed and the information made available to the grower. Severe losses and hardships due to shifts in production could be tempered or avoided. I understand the Bureau of Agricultural Economics is at present making just such a survey of the peach industry. It is a very commendable type of project and should receive the full appreciation and cooperation of the cooperative associations and the state agricultural institutions.

Such information shows what the present production program is composed of and its future trend through the new plantings. Such information obtained through the farm management worker would serve as a sound basis for production recommendations. It should be connected with the market demands and would then serve as the basis of a commodity program. This would include both production and distribution. Information of this type for the different commodities would help much toward an agricultural program. It is essentially a state, regional, and national problem. The United States Department of Agriculture, through the Bureau of Agricultural Economics, must be the leader of the work. It is our national agricultural institution. However, all the various state institutions and cooperatives interested in this manner will not lie dormant in the research files; the cooperative association would use it to their great advantage, and the extension specialist would have a sound basis for his teachings. This type of research reaches the individual quickly and effectively. The farm leaders promptly grasp its significance and use it among their membership. It brings to the cooperative a clearer understanding of the value of his agricultural institutions and makes the most effective work.

Numerous other illustrations could be given but in principle they are similar. I will close with the trite statement that research for cooperatives is not far different from that of other commercial corporations. Its application may be different but the fundamental needs are the same.

STUDIES OF MARKET SUPPLY, PRICE, AND SALES AS A BASIS FOR CONTROL OF DISTRIBUTION OF PERISHABLES¹

W. P. HEDDEN

PORT OF NEW YORK AUTHORITY

To orient this paper in the general discussion of marketing research I shall preface my remarks by distinguishing between marketing and production as related to the use of market price studies. Adjustment of supply to market demand may mean a change in the long-time trend of planting or intensity of cultivation, a shift to production of a different commodity or variety of a commodity, or a change in the volume or direction of flow to market. All commercial production is ultimately destined for a market, hence market price research is of importance in planning any program of production. However, the objectives and utilization of such studies may assume quite different aspects, depending upon whether the interest be that of adjusting a long-time organization program or that of establishing a month to month or day to day marketing policy. The farm organization aspects of adjusting production to market will be covered at length in later sessions. I conceive the program for this evening to be concerned with regulation of volume and direction of flow to market from month to month or from day to day.

A further distinction in the approach to market price studies is inherent in the character of the commodity under analysis. Relatively non-perishable farm products such as wheat, corn, cotton, and the other great staples, for which a season to season carry-over is common and for which a complex system of national or international markets are maintained to deal in cash or future options, present one type of problem. I anticipate that Mr. Working's paper will deal primarily with this type. Without meaning to step into his field I should expect the objectives in price analysis

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 28, 1925.

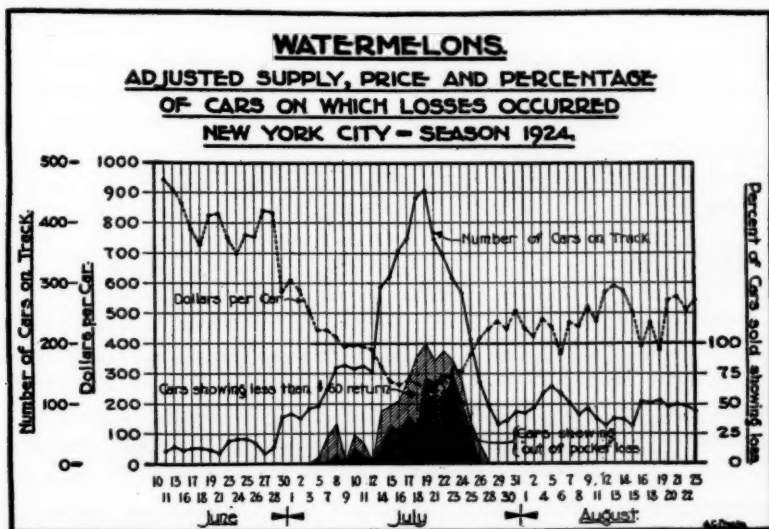
of these staples to be the determination of the average price level year by year and the associated seasonal fluctuation month by month or week by week. The answer which the producers of these commodities require is whether to hold or to sell at a given price. The answer to that question is based upon a knowledge of whether the existing price is high or low relative to that which the factors of supply, general price level, and seasonal influence indicate will prevail in the immediate future. I will not further encroach upon Mr. Working's subject.

By gradual steps, permitting of only rough and ready classification, we proceed to the semi-perishable group, apples, potatoes, onions, butter, eggs, cheese, and others of similar character, where season to season carry-over is not so important, where no well-organized future market exists and yet where storage stocks, exports and imports, and country-wide production bear upon the prices. This group resembles the non-perishable group in that the marketing program of the farmer is concerned chiefly with whether to sell or to store. Research must tell him whether existing prices are high or low in relation to probable prices later in the season. A third category, including lettuce, tomatoes, spinach, Southern cabbage, berries, melons, peaches, etc., presents a distinctly different problem, requiring even more intensive study than the others. Fluid milk might be added to this class. The outstanding physical characteristic of this group is perishability. The outstanding commercial characteristic is price variability. Susceptible of storage for only a limited period, passing daily into consumption, the supply must be shipped into any market with the nicest adjustment to demand or else the penalties are erratic price declines, accumulations of deteriorating carlots, congestion of terminal facilities and economic losses throughout the entire marketing channel.

The disasters which result from periodic glutting of the perishable market are so well known that it is not necessary to dilate upon them. One point deserves emphasis. It is demonstrable that all agencies engaged in selling and handling these products during glut times suffer in common, although

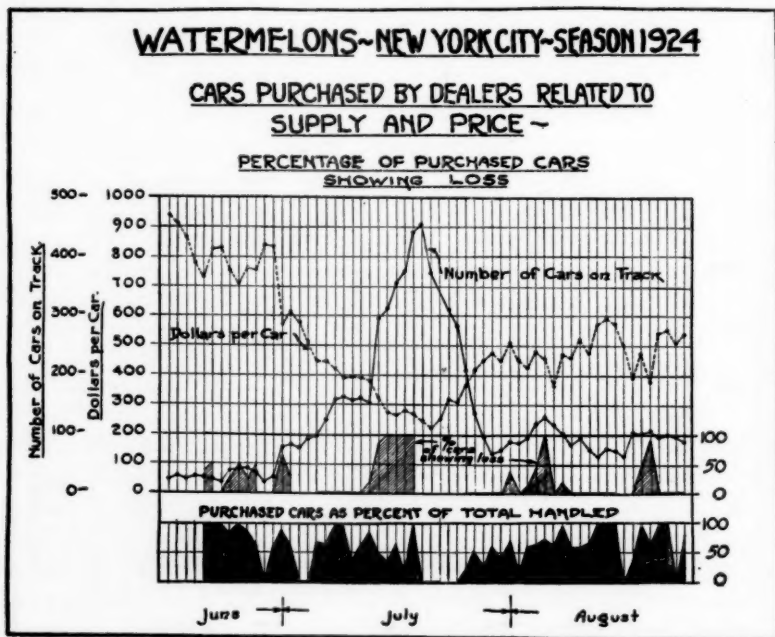
in varying degree. That the producers and shippers may expect "red ink" returns when the market is over-supplied is accepted as a matter of course. It is not so well known that dealers, despite their better knowledge of the market and their stronger strategic position, also lose. Though they are able to escape, to some extent, by buying at points where freight costs are more favorable or by refusing to accept cars on any but a consignment basis, nevertheless the losses are there. The carriers, too, are subject at these times to increased loss and damage claims resulting indirectly from congested facilities and "lost markets." Where freight is not prepaid they often lose large portions of their revenue on account of the refusal by consignee to accept delivery of a car on a declining market. Even truckmen complain that they suffer when their trucks wait in line for hours to enter congested piers or yards only to find that the receiver has rejected the car and has no work for them.

Some illustration of actual losses on these perishables during periods of over-supply will make their significance more easily grasped. The chart below shows how the periodic piling up of watermelon cars affected the growers' returns during the season of 1924. You will notice that when the solid line



indicating the number of cars on track rose above 200 the shippers were receiving not only no return but were paying out-of-pocket for the expensive privilege of having the melons hauled up here, a distance of 1,000 miles, to end, in some cases, in the dump. The heavily shaded area shows those cars actually yielding an out-of-pocket loss while the cross-hatched portion above shows cars on which the return to shipper was less than \$60 (6 cents a melon), certainly a minimum compensation for the labor of growing melons. During the period from July 18 to 23, 75 per cent of the cars resulted in an out-of-pocket loss and on one day, at the very peak of the supply, no car returned more than \$60.

A second chart shows a somewhat similar situation among the dealers during the period of heavy supply, when many cars bought f.o.b. shipping point returned losses to the dealer. You may notice, also, the considerable shift during this period from f.o.b. purchasing to handling on consignment only, which is characteristic of the more astute city dealers during these times.



Our study of another perishable—Southern lettuce—showed the manner in which the carriers are affected by over-supply and declining prices. Whenever the wholesale price falls under the freight cost, rejections begin to show up. In all, some 141 cars of this one commodity were refused by consignee during the first four months of 1923. Not only did the carriers suffer a freight deficit, amounting to \$37,000 or approximately 10 per cent of the gross revenue, but more important, perhaps, from the public viewpoint, much of the produce was actually wasted. The selling agent of the railroad disposed of a certain amount of the refused lettuce at public auction for as low as 20 cents per basket of 36 heads; but throughout the season some 13,000 baskets, or close to one-quarter of the amount rejected, had to be dumped. During the twelve-day period of extreme over-supply, from March 16 to 27, 66 cars were rejected and 25 dumped because they could not be disposed of at any price. To show that this is not an exaggerated example I might add that the total rejections for the principal perishable commodities, such as lettuce, cabbage, cucumbers, beans, on this one carrier amounted to 125 cars in 1921, 202 in 1922, 221 in 1923, and for the short period of three weeks in 1924 177 cars. The economic burden upon the carriers of hauling these valueless cars is sure to be reflected in general costs of transportation.

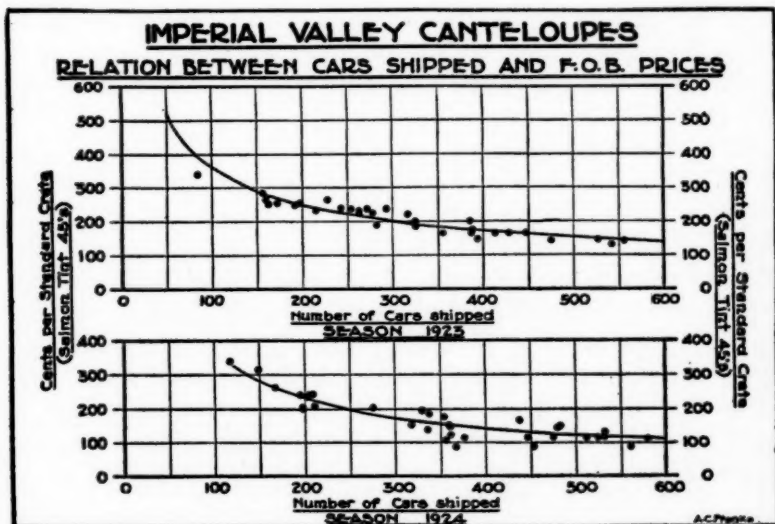
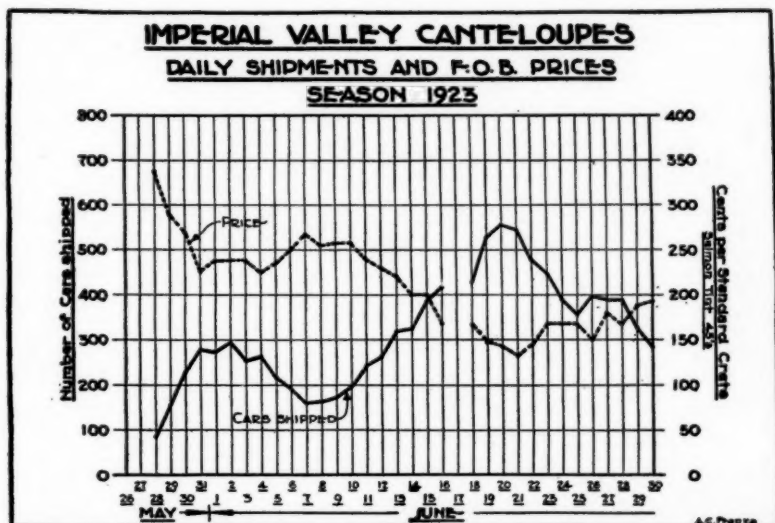
Even in retailing, the losses due to inaccurate forecasting of consumers' needs become a very important item. In a large number of stores where records of fruit and produce deterioration are kept, it is reported that 14 per cent of the retail value is lost through wastage, three-fourths of which is actual dumping of unsold perishables. More accurate gauging of consumer demand is therefore very important, although research in that direction must necessarily take a somewhat different line than the study of shipments from producer to terminal markets.

It is scarcely necessary to continue longer in this strain, for the desirability of more accurate gauging of the perishables market may be readily admitted. No administrative scheme for cooperative direction of perishable shipments can be more successful than the knowledge of its administrators

permits. Hence, a basic need is intelligent understanding of the forces influencing market prices and sales, and quantitative measures of the probable future effects of these forces in any given market on a particular day. As in all economic phenomena the factors determining the price of lettuce or peaches, or the sales of watermelons or milk from day to day are varied and complex. They may be grouped for convenience under the time-honored categories of supply and demand but in order to isolate them in any practical manner it is necessary to define precisely in each market situation the influences which have significant bearing upon price or sales. Because of the slow growth of quantitative studies in this field I cannot present to you a comprehensive study of a single commodity but must illustrate my point by a mosaic of perishable distribution analysis. The discussion cannot linger over details of method, nor the theoretical implications behind the analysis. By definition we are analyzing adjustments of supply flowing to market at a particular time. It is fitting that we examine a shipping point market for one of these perishables.

A good deal of attention has been paid to the Imperial Valley cantaloupe deal in times past. Fairly complete statistics of shipping point prices and car movements have been compiled for several years. Market reports each season remark the tendency toward a decline in prices soon after the shipping season opens with a subsequent recovery in the following weeks, followed by another decline. What factors are related to these price movements? Are the daily offerings, as measured by car shipments, a sufficient explanation, or changes in weather, or what? Not having had the opportunity to make a thorough statistical analysis of these data, nor as yet having any intimate knowledge of the cantaloupe industry in Imperial Valley, I do not propose to answer with finality the questions I have raised. Nevertheless, even such casual analysis as I have been able to make of the officially published figures shows a striking relationship between daily prices and daily shipments during the last three seasons—1922, 1923 and 1924. Shipments from the Imperial Valley show a considerable seasonal fluctuation. The expected inverse association of high

price with small supply and low price with large supply is apparent in the chronological plot for 1923. Plotting daily prices and shipments as coordinate points on a "scatter diagram" we may see for 1923 and 1924 seasons the close association between the price and supply. For those who are



statistically inclined the fitted curve is of the hyperbolic type, $\log y = \log a + b \log x$ (which becomes a straight line on a double-log plot). Coefficients of correlation for the three years are as follows:

$$1922 \ r = .893 \pm .028$$

$$1923 \ r = .935 \pm .014$$

$$1924 \ r = .931 \pm .016$$

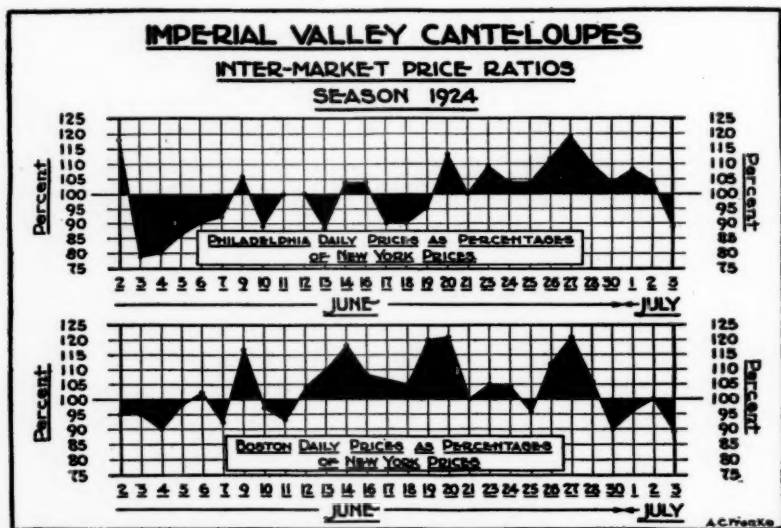
The standard error, or range into which it may be assumed that two-thirds of the predicted values will fall, is about ± 10 per cent. Dropping technical jargon, this superficial analysis shows that an increase of 1 per cent in cars shipped will cause a decline of six-tenths of 1 per cent in the price per standard crate of 45 cantaloupes, and the predictions made from a knowledge of shipments alone would in two out of three cases be within 10 per cent of the correct price. At this particular point I am not concerned with the accuracy with which the f.o.b. price of cantaloupes can be forecasted from this formula. If I were engaged in an intensive study of this particular commodity I should want to investigate the effect of weather also, not only upon price but upon the manner in which shipments are made each season. I should want to know the effect of the general level of price and total cantaloupe production upon the average about which the daily prices fluctuate. Just now I am more concerned with what use could be made of such a detailed study. After these factors shall all have been evaluated and combined into predictions of sufficient accuracy, a distributing directorate could adjust, as far as physical conditions permit, the flow out of Valley in order to stabilize prices at a point of maximum return, that is, a price which would move most cars and still bring in revenue above costs. They could anticipate the limit of offerings which would depress price below costs of harvesting and packing, and by culling out those grades and sizes which do not pay for harvesting and shipping could keep inside that limit. I am aware of the practical difficulties of rapid ripening, of inadequate car supply, and of lack of cooperative effort among growers to perfect the carrying out of

such adjustment. These are administrative problems to be met, but at least we may know what goal to aim at in devising a marketing policy.

Low shipping point prices reflect an impending oversupply at terminal markets better than the more optimistic shippers realize. When dealers' representatives retire from the shipping point markets the growers' possibility of realizing profits by selling on consignment must be balanced against the probability of having to make out-of-pocket payments for freight, as we have noted in the case of watermelons. If, instead of selling at shipping point, a growers' cooperative organization undertakes the distribution of the crop direct to consuming centers there is the added responsibility of allocating cars properly between the markets. This is the second phase of adjustment. The direction as well as the total volume of flow is involved. The theoretically ideal distribution, I suppose, is that allocation which maintains the prices in all markets at a parity, with due allowance for freight differentials. There may be some question as to whether such a parity is the ideal relation but only exhaustive study of each market can tell whether maximum returns are to be achieved at similar prices in all markets. Assuming that the distributing organization does desire to maintain intermarket parity, allowing for freight costs, which policy I am told was aimed at by the Imperial Valley cantaloupe and Georgia peach crop distributors, then how can it be done? No casting up of carlot receipts as a whole and calculation of average percentage quotas will do. We know that in a season Philadelphia takes approximately 35 per cent as many cantaloupes as New York and Boston 25 to 30 per cent as many as New York, but a shipping policy based "on the average" will not suffice. Market preference for certain sizes and varieties, local daily buying habits, fitness of terminal facilities for daily carry-over, contrasting weather, and local holidays may all affect the price at individual consuming centers.

The next chart shows how cantaloupe prices in three eastern markets, Boston, New York and Philadelphia, were

related to each other during the season 1924. The lower graph shows the Boston price day by day as a per cent of the New York price. We can see a more or less cyclical movement with Boston prices sometimes 10 per cent lower than New York and sometimes 20 per cent higher. Again on the upper graph we see periods when the Philadelphia

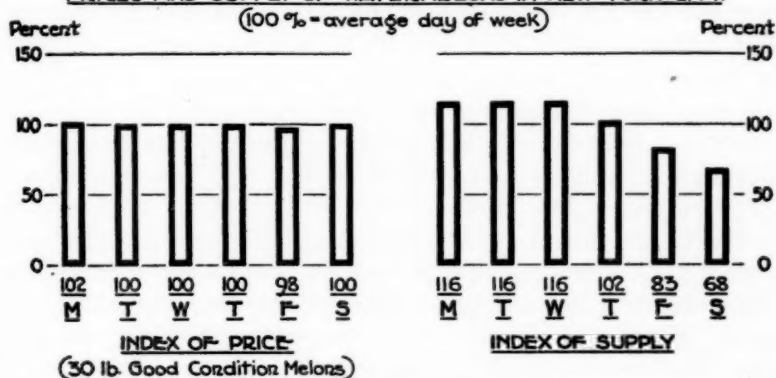


price was sometimes 20 per cent higher, sometimes 20 per cent lower. On certain days the price differential between these three markets, all of which have substantially the same transportation costs from the Imperial Valley, was as high as \$1.25 per crate, or \$420.00 per car. No doubt, supply, total supply on track rather than new arrivals alone, is the major influence upon price. When the Philadelphia price was \$1.25 per crate above New York on June 2, the supply in Philadelphia was only 15 per cent as great as New York. On the next day, June 3, the Philadelphia price fell \$1.00 under New York on account of heavy receipts almost equaling those at New York. The complete explanation for price variations must also take into account the individual demand peculiarities of each market.

The evaluation of demand influence is a difficult statistical problem. Demand is not a material quality which can be stated in definite units like carlots of supply. However, variations in price, not accounted for by changes in supply, and variations in quantity sold, not accounted for by price changes, can be related to days of the week, to weather conditions, to holidays. The daily buying habits of jobbers in the wholesale market of New York are important considerations in establishing prices and volumes sold. In analyzing shipping point prices of cantaloupes no consistent daily demand variation appears, the prices being set by a given offering without regard to whether it is Monday morning, Wednesday morning, Saturday morning, or Sunday morning. In buying for transcontinental shipments it is natural that as many buyers will be in the market one day of the week as another, unless religious scruples bar Sunday. In contrast, the New York market, and for that matter any terminal market, exhibits distinctly higher prices on Monday than the supply would normally indicate; or, viewing the situation from another angle, large supplies on that day do not depress prices. The daily index of watermelon supply here charted was obtained by averaging the ratios which each Monday's, Tuesday's, Wednesday's, etc.,

INDEXES OF DAILY VARIATION

PRICES AND SUPPLY OF WATERMELONS IN NEW YORK CITY.



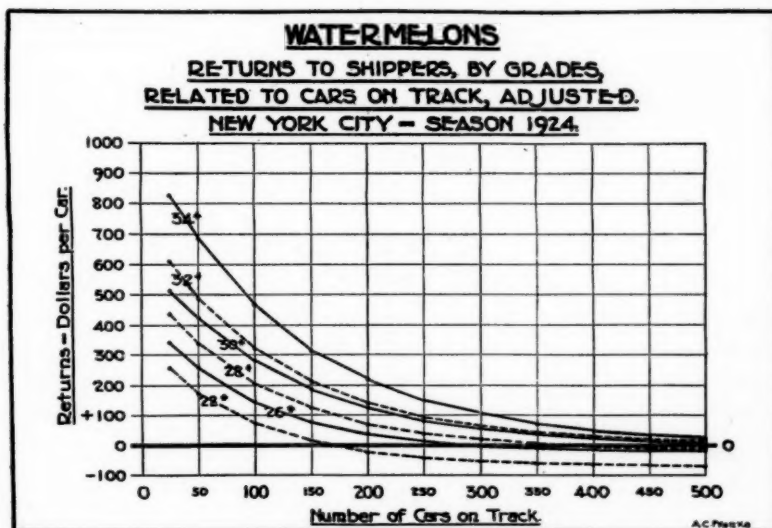
(Based on season of 1924.)

supply bore to the weekly total or daily mean thereof. It shows Monday as averaging 116 per cent of the daily mean while Saturday is only 68 per cent. In contrast, prices show little or no consistent daily variation. We may, therefore, infer that demand varies in a manner comparable to supply, since price is unaffected. For other perishables a similar average variability is noticeable in the index of supply, accompanied by a constancy of price. Wherever buyers stock up with perishables during the early part of the week and attempt to clean up on Saturday we may anticipate a variation in day to day demand. On watermelons this variation is so considerable that almost twice as many melons can be put in the market on Monday as on Saturday with the expectation of getting the same price on both days.

Weather conditions play a part in creating demand although not in a comparable degree to daily buying habits in the wholesale market. Volume of sales rather than price appears to be affected by weather. Prof. H. A. Ross, of Cornell University, in his excellent study of *The Marketing of Milk in the Chicago Dairy District* finds that a deviation of maximum temperature on a given day from the average of the maximum temperature of the previous seven days of 1 degree F. changes the sales of bulk wholesale milk from 1/10 to 5/10 of 1 per cent when other factors are held constant.

There are other relationships to be worked out and incorporated in any intensive survey of a particular market. The responsiveness of demand to price changes, as shown in increased or decreased sales, is important information for any sales manager in deciding what price to quote the buyer. Again we must leave the details of economic and statistical analysis and return to the possible use of this information. Any cooperative organization undertaking to distribute direct to terminal markets must allocate cars properly between markets as well as control the total volume shipped. To prevent the flooding of markets the known demand influences, such as day of the week, predicted weather, local preferences, must be calculated, combined, and used in

conjunction with the normal supply-price relationship to see whether the number of cars which are headed for that market are likely to depress the price below fixed marketing costs. If it appears from reports of car shipments and passings that the prospective supply destined for a given market will drive the price below such a minimum as freight costs, then diversions to less saturated markets, or temporary holdings en route are in order. If all markets are likely to be glutted then the excess produce should be stopped at shipping point. To talk of such a policy may conjure up in the minds of *laissez-faire* enthusiasts the bugaboo of valorization, restriction of output and price control. I submit, however, that when excess shipments, comprised largely of grades and sizes which will not pay the cost of freight, are sent 1,000 to 3,000 miles to end in the dumps, there is no economic argument for continuing such practices. Direction of supply simply means proper allocation between markets. Control of total volume means culling out the poorer stuff when the peak shipments occur. During the early part of a shipping season, when all supplies are light, any variety and grade fit for consumption is eagerly snapped up; but when a terminal market is receiving 200



or 300 cars daily, it behooves the shipper to cull with care. A final chart shows with considerable exactitude just what sizes of Tom Watson melons will pay the cost of freight from Florida, Georgia, and the Carolinas to New York City. When the supply was light in 1924, say 50 cars, practically any size melon sold well above freight costs but by the time total supply averaged 200 cars the 22-pound melons were netting out-of-pocket freight losses; at 300 the 26-pound melons became unprofitable for shipment; at 400 cars only the 30, 32 and 34-pound melons were yielding any gain.

This is a lesson which I should like to have driven home to the shipper. Ship everything you have at the beginning of the season or whenever the supply is scarce; but when cars begin to accumulate, keep all but the best at home and though you may weep at the sight of them rotting in your fields you will not have to weep at the sight of a dun for freight bills while your melons rot in railroad car yards.

PRACTICAL APPLICATIONS OF CORRELATION STUDIES OF PRICES¹

HOLBROOK WORKING
FOOD RESEARCH INSTITUTE

It is now fifteen years since Professor Persons demonstrated by an illustration from corn prices² the possibility of obtaining a definite quantitative statement of the relation between production and price of a farm product. Four years later, in 1914, Professor Moore made a similar application of correlation methods to the study of the relation of price to production of corn, oats, potatoes, and hay,³ and Professor R. A. Lehfeldt published in the British *Economic Journal* (June, 1914) a study of the relation of production to price of wheat. Professor Moore has continued his work along these lines, and within the past five years a number of other students have published a series of some fifteen studies applying similar or related methods in quantitative studies of the factors influencing prices of farm products.

The time seems ripe for a consideration of the practical uses which such studies may serve. Recognizing that this type of study is still in the experimental stage, we may yet hope to draw from the results already obtained some conclusions as to its probable future usefulness. The problems of planning the direction of our expanding research in agricultural economics and of training students for the making of future studies and for the intelligent use of the studies of others, make such a consideration particularly pertinent at the present time.

The Criterion of Practical Usefulness

There is a general tendency to look upon correlation studies of prices as providing a means for forecasting prices and to judge their usefulness by the excellence of the forecasts which they yield. Fundamentally this judgment is sound, for it is in their applicability to forecasting that such studies must

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 28, 1925.

² "The Correlation of Economic Statistics," *Pub. Amer. Stat. Assn.*; 92, Dec., 1910.

³ *Economic Cycles: Their Law and Cause*. New York. Macmillan.

have their principal practical usefulness. But there is a further general tendency to set up a specific criterion of usefulness in price forecasting which is unsound: the criterion that the statistician should be able to take the results of his study and make better forecasts from them alone than can be made by anyone else without them or at least better forecasts than most well-informed people can make without them. Essentially the same criterion is sometimes held in the form of the requirement that anyone making proper use of the results of the statistical study should be able to make money by speculating in the market on the basis of the forecasts alone. Few statistical studies if any can satisfy these tests. The expectation that they should is doubly pernicious because it leads on the one hand to misapplication and on the other hand to a failure to make use of the results in many of their valid applications.

The true test of practical usefulness of correlation studies of prices is that they yield conclusions which, properly applied in connection with other information, make possible the improvement of our forecasts. Applied for purposes of speculation by an ill-informed speculator, the improvement in the forecasts may not result in handsome profits, but may merely reduce losses.

Accepting as the criterion of practical merit, not perfection, but the discovery of any bit of useful knowledge, every scientist will recognize further that the practical usefulness of such knowledge is not to be judged solely by the applications which are immediately possible, but also by the practical applications which may be made of other knowledge for which the first has merely laid the foundation. Much of the work which has been done on correlation studies of prices has been laying foundations, and few practical applications have been made. It is possible, nevertheless, to make some estimate of the uses to which such studies may be put.

Information Contributed by Correlation Studies

At one point the correlation studies are distinctly limited. They can deal only with factors for which fairly reliable statistical measures are available. As our statistical information

becomes more complete and more accurate this limitation will become less serious, but it is not to be expected that reliable statistical measures will ever be available for all the factors which deserve consideration. This limitation must always leave a need for supplementing the results of correlation studies with judgments based on additional information. Examples are multiplying, however, of cases in which available statistics are supplying indirect measures which prove surprisingly useful. A case in point is Sewall Wright's discovery that the average live weight of hogs marketed during the summer gives an excellent index of the extent of breeding.

Correlation studies of prices may give two kinds of information: first, qualitative, what factors have been important in influencing prices in the past; and second, quantitative, precisely what has been the influence of these factors. The majority of the studies thus far made, having dealt primarily with the relation between supply and price, a relation known to exist, have not aimed at increasing our qualitative knowledge. Nevertheless, H. A. Wallace's early study of the relation between the price of hogs and receipts in important markets⁴ made an important contribution in showing that the relation was not very close. It indicated that we must go beyond current receipts to get a satisfactory explanation of the changes in hog prices—that receipts did not furnish as complete an explanation of price changes as many had supposed. Similarly, Lehfeldt's study of wheat prices⁵ and other similar unpublished studies, have made it clear either that other factors than world production of wheat are very important or that our production figures are highly inadequate.

Among published studies of prices, the most productive in qualitative information has been Sewall Wright's study of corn and hog prices.⁶ The relationships which he has discovered are highly complicated, however, and I find a readier illustration from my own study of potato prices.⁷ Among the qualitative results bearing on the factors affecting the

⁴ *Agricultural Prices*. Des Moines. Wallace Publishing Company, 1920.

⁵ *Economic Journal*, XXIV, June, 1914, pp. 212-17.

⁶ *Corn and Hog Correlations*. U. S. D. A. Bulletin No. 1300.

⁷ Reported in part in *Factors Affecting the Price of Minnesota Potatoes*. Minn. Agr. Exp. Sta., Technical Bulletin No. 29, and in "Factors Influencing Price Differentials Between Potato Markets," in this Journal, Oct., 1925, pp. 377-98.

average price of potatoes in St. Paul and Minneapolis during the late crop season the more important are:

1. That it is the late crop rather than the total United States production which should receive primary consideration.

2. That August price has a very important indirect effect on subsequent prices.

3. That the effects of changes in general business prosperity, if any, are negligibly small.

4. That a concentration of the crop in one section of the United States, while tending to lower the price in that region, relative to others, has another effect which, in western sections, works in the opposite direction, so that a change in distribution of the crop has no measurable effect on the price in St. Paul and Minneapolis but a very important effect on the prices in eastern markets.

5. That there has been no falling off in demand for potatoes since 1920 such as is supposed to have contributed to the recent low prices of many farm products.

The second type of contribution of correlation studies of prices is in the knowledge they give of the *amount* of the influence of the different factors determining prices. For example, it becomes possible to state that, expressing the effect in terms of dollars at the present price level, a decrease in production of ten per cent from the normal for 27 late crop states raises the average seasonal price throughout the United States about thirty-five cents a hundred-weight (26 per cent); an increase of ten cents in the price in August indicates a decrease in the amount of potatoes left for later consumption to an extent that raises the price for the remainder of the season by three cents. The effect of different amounts of increase or of decrease in these factors is not proportional, but may be stated with about the same degree of certainty. Many other examples might be cited, practically all of the published studies leading to similar quantitative statements of relationships.

These quantitative statements of the relationships observed in the past are rendered particularly useful in the case of potatoes because they are dependent upon certain

causal connections which are relatively stable and not likely to change either quickly or radically. Relationships requiring investigation are not always so stable. Among Sewall Wright's conclusions from his study of hog prices is one which leads to the statement that, other factors remaining constant, an increase of ten cents in the December 1 farm price of corn raises the hog price of that winter 56 cents a hundred and the hog price of the following winter 32 cents, and that an increase of ten pounds per head in the average summer live weight of the hogs received indicates an increased breeding which will lower the price 89 cents in the second following winter.⁸ The relationship between hog prices and corn prices of the current winter is probably relatively stable, depending largely upon the tendency to fatten less heavily when corn is high; but the relation between hog prices and corn prices of the preceding winter, depending as it probably does largely on the tendency of farmers to sell their breeding stock and curtail breeding in a year of high corn prices and unprofitable hog raising and thus produce a shortage of hogs, is less stable and might be entirely changed if farmers should learn to maintain production on a steadier basis. In such a case, special attention must be given to the possibility of a change in the relationship. As Dr. Wright says, "The general use of prediction formulas would itself be a factor that would tend to modify the system of relations on which predictions were based. This, indeed, would be the greatest good they could bring about."

Reliability of Conclusions from Correlation Studies

Thus far I have assumed that the results of the correlation studies are to be considered reliable, both as to their evidence on the factors which have had an important influence and as to their conclusions on the quantitative relations which have existed. As in the case of all scientific investigations, the methods and results of correlation studies of prices require

⁸ *Corn and Hog Correlations*, p. 57. The regression equation on which this statement is based appears as the last on the page.

careful and critical testing. The tests of reliability of scientific investigations are in general not tests which can be applied by the layman. The necessary critical examination of methods and results of correlation studies of prices must be made by the worker himself and his fellow-workers in the field. To this end, the results should be published not only in relatively popular form designed to make their meaning clear to the reader unfamiliar with the technical methods, but also in technical form for the study of technical workers.

The tests or criteria of reliability of results are, in general, two. The first requirement is that the methods used be such as are adapted to discovery of such relationships as may exist. We know that certain general requirements can be laid down. Account must be taken of the so-called trend element lest the final result represent merely a relationship between trends, to which no significance can ordinarily be attached. Usually it is necessary to express the data as ratios to trend, or to subject them to some other adjustment to make reasonable the necessary assumption that a certain quantitative relationship persists throughout the period covered. Account should also be taken of the possibility that relationships may be non-linear.

In addition to these very general requirements for adequacy of method, every study meets special problems of choice of data and selection of method, the requirements for proper solution of which can scarcely be put in general terms. Most of these, however, are not primarily statistical problems and any close student of prices in the field in question, even without statistical knowledge, is competent to judge the adequacy of these aspects of the method.

The second test of reliability of results hinges on the question, "what is the probability that the relationship discovered is purely a chance result?" Last summer I observed that I had a perfect basis for forecasting rain: it rained every time I watered my garden. Of course the facts on which I based this conclusion were limited; they consisted in fact of only three observations. As the number of observations increases, the probability of any serious contamination of the results by chance relationships decreases. Mathematicians have worked

out fairly satisfactory measures of the probability of errors arising from such causes and these deserve careful attention, bearing in mind that in certain cases, especially where cycles are involved, the probable errors may be much larger than given by the usual formulae.

In connection with this discussion of the probable error of results, it is worth noting that while every effort should be made to obtain results with as small a probable error as possible, the existence of a considerable probable error does not necessarily invalidate the result. In business many decisions must rest on conclusions which are admittedly uncertain. Even though the probable error of a result be large, it may still be worth using if it furnishes the most reliable information to be had.

Inference of Future Applicability

Having satisfied ourselves of the reliability of the results of any correlation study of prices, there remains the question of the applicability to future uses. A statistical study, of itself, tells merely what has happened in the past, what relationships have been observed. Any assumption that similar relationships will be observed in the future is a matter of inference. This is not the place for a discussion of the bases upon which such an inference may be justified, but it is important to note that any application of the results of a correlation study to future cases involves this inference that relationships remain the same. In some cases the inference clearly is not justified. The relationship between production and price of oats, for example, has clearly suffered considerable change since the introduction of the automobile and the truck; in the latter part of the last century the development of cold storage methods introduced a profound change in the relationship between seasonal changes in production and price of most perishable commodities. The problem, however, is not peculiar to the application of conclusions from statistical studies. All our knowledge and judgment must be based on past observation and its application to future problems in-

volves the same inference that essential conditions remain substantially the same as in the past.

Inherent Advantages of the Method

In addition to the evidence of significant discoveries resulting from correlation studies of prices, examples of which have been noted above, there are certain general considerations which recommend the method as one likely to give superior results wherever it is applicable. The alternative to correlation studies is the formation of judgments based on general observation, experience, and such simple statistical studies as are possible without the use of correlation methods. The usual bases of judgment, which may be summed up in the term "general observation," find a principal weakness in the inability of the human mind to grasp and interpret a large number of facts at once. Judgments are commonly based primarily on information covering only a few years. The fallibility of conclusions based on a small number of observations is notorious among scientists. Any careful check on conclusions reveals the important part which chance may play in invalidating such judgments. Conclusions no more valid than my discovery that it rained every time I watered my garden are a common result when the facts considered are few. Where the data are available, correlation methods permit the simultaneous consideration of a much more adequate body of facts than can enter into conclusions based on general observation.

General observation is particularly weak when it is necessary to form quantitative judgments. No one who knows the facts doubts that the price of potatoes should be higher this year than last, but how much higher? Is it too high or too low at the present time? Any decision on this point requires a judgment as to the *amount* of effect to be expected from the shortage in supplies, a judgment which must be based largely on observations of the amount of effect observed in past years. Such observations of past effects are essentially statistical in character and the application of correlation methods merely substitutes a refined for a crude method of

measurement. Wherever the data justify application of careful methods the better method must be expected to yield improved results.

Common observation fails again when the relationships are not fairly obvious. Figure 1^o shows in the upper curve the changes in average seasonal price of potatoes from 1902 to 1923. The second curve shows the changes which remain after removing the effect of the changing general price level and a slight additional upward trend. The final curve shows the changes which remain unexplained after removing the calculated effects of all the factors for which measurements were obtained. Assume the existence of some one factor so important that it would explain all the previously unexplained variation in the value of potatoes, as represented by the final curve on this chart. A chart showing the variation in such a factor would present a curve looking almost exactly like the final curve here, though perhaps inverted. Let this curve stand in place of the curve on such a chart and compare it with the fluctuations in price of potatoes as actually observed. Would anyone suspect a relationship on the basis of inspection alone? Only after the calculated effects of more important factors have been removed by correlation methods is it possible to discover or demonstrate the influence of the less important factors.

These advantages of correlation methods over general observation are particularly important when the basis of experience and observation is limited. Most dealers base their judgments on extensive experience and observation; lacking such a basis of judgment they are likely speedily to be eliminated from business. But farmers generally and even some managers of cooperative associations and public-spirited advisers of the farmer insist on forming judgments regarding prices on a most inadequate basis of experience and observation. The advantages of conclusions based on correlation methods are sufficiently great as compared with judgments based on the most adequate of general observation. Compared with judgments based on more limited observation the advantages are correspondingly greater.

^o Reproduced from Technical Bulletin No. 29, Minn. Agr. Exp. Sta.

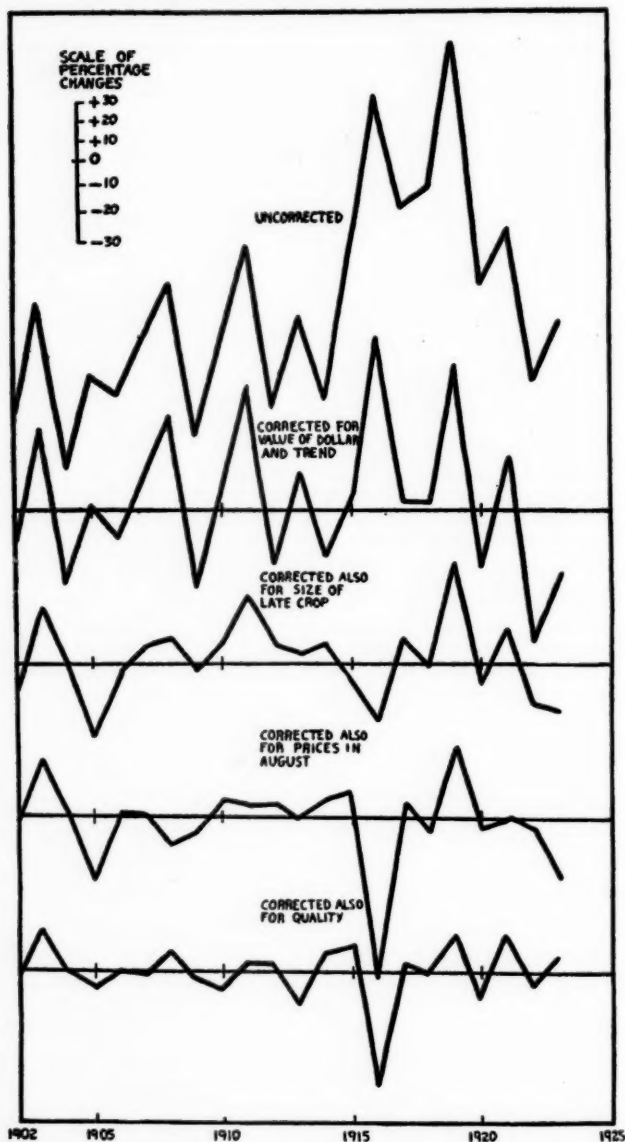


FIGURE 1. CHANGES IN SEASONAL AVERAGE PRICE OF POTATOES IN ST. PAUL AND MINNEAPOLIS, ACTUAL AND CORRECTED FOR INFLUENCE OF VARIOUS PRICE FACTORS.

Elimination of the effects of the more important factors on the basis of a correlation analysis gives a curve of fluctuations remaining to be explained, from a study of which effects of additional factors can be discovered much more easily than from a study of the original price changes. It serves also to verify the accuracy of the original calculation of trend: if the deviation of the second curve from the trend (the horizontal line) were partly the result of inaccurate fitting of the trend line these deviations would persist in the final curve.

*Practical Usefulness in Facilitating a Better Adjustment
of Prices*

Perhaps the most obvious practical application of the results of price studies is as an aid to money-making through speculation. We shall limit ourselves, however, to a discussion of what may be called the social gains. These gains may be expected in the form of a better adjustment of prices and a more economical adjustment of production.

Considering first the adjustment of current prices, we observe that one of the outstanding characteristics of price movements of every commodity which is produced seasonally, requiring the carrying of large stocks through part of each year, is the frequent recurrence of periods of unjustifiably high or low prices. The extreme reached by wheat prices a year ago is fresh in the minds of everyone. The very low prices reached by wheat in August and September, 1922, and maintained through most of the season of 1923-24 seem to have been similarly unjustified. In the fall of 1921 corn prices suffered a similar collapse from which they did not recover until the late winter, when it became apparent that they had been far too low. Two years later a short crop caused a panicky advance which carried prices in October, 1923, to equally unjustified high levels. Potato prices, less closely watched by most, experience even more extreme fluctuations. In the winter of 1923-24 the discovery that potato prices had been too low was followed in St. Paul and Minneapolis by a rise of over 50 per cent in eleven days, a rise due principally, not to any temporary local shortage, but to a sudden change in judgment of fundamental conditions.

These extreme fluctuations promote speculation, add greatly to the risks, and presumably to the expenses, of marketing, and cause serious losses to many. Farmers and dealers alike try to forecast them. To the man whose forecasts average well, these fluctuations mean handsome profits, but to the man whose forecasts are poor, the losses are correspondingly heavy. In general the farmer, being the less well-informed, is the loser on these guesses.

The only corrective for these extreme fluctuations, aside from price fixing by the government or by powerful cooperatives, is to be found in improving the information and judgment of those who buy and sell on the markets. In this, correlation studies of prices may play a most valuable part. Nor is it necessary that they reach a point where they add to the knowledge and judgment of the wiser dealers and speculators for them to have this beneficial influence. So long as they contribute to better judgments on the part of farmers or any other important element in the market, they will aid in the better adjustment of prices. In most such extreme fluctuations the wiser dealers and speculators recognize the unsound position of the market and profit from it while the ill-judged selling or holding of farmers and selling or buying of amateur speculators carries the price to further extremes. One of the first practical applications of correlation studies of prices should be in making the results available to the less well informed elements in the market, and perhaps especially to the farmer.

A special application of the results of correlation studies of prices appears in the cases where cooperative associations have gained control of the bulk of the product and undertake to set a price for the season which will move the crop, or where less powerful cooperatives undertake to judge the market and sell their product when prices are best. A thorough understanding of the forces which determine prices is particularly important for these; it may mean the difference between success and failure for their organizations. To them every bit of information which may be contributed by correlation studies of prices is of the utmost importance, the more so if they are controlled by men whose experience and judgment in price matters is not of the best.

A word may be said on the problem of making available the results of correlation studies of prices so that they may exercise their steadying influence on the market. As it is the least well-informed element in the market which most needs to be reached with this information, so is it the least well-informed element which is hardest to reach. To this

element, a technical statement of the conclusions is of little value. The conclusions must be stated in a form they can understand and interpreted in the light of current conditions. The temptation in such cases is to issue a simple forecast as the most direct means of giving the available information. But forecasts are dangerous because always uncertain, and are especially bad, standing alone, because they leave the user powerless to supplement them with his own information and judgment, some of which may be highly important. What is needed is a prompt current statement of conclusions which follow from the correlation study, so stated that the user may understand their basis and supplement them with available information on factors not included in the correlation study.

Practical Applications in Production Control

The application of results of correlation studies to the control of production, which I have reserved for final consideration, seems to me at once to constitute the most important use to which they can be put by agricultural colleges and other public agencies aiming to help the farmer, and at the same time to offer the widest opportunity for using results of studies which are still far from complete. The Minnesota Potato Market Letter of last March offers an illustration. Studying the potato acreage situation last spring, it appeared that an abnormally small acreage was clearly to be expected. The acreage in late crop potatoes had been decreased two years in succession and with the extremely low price that had prevailed during the winter of 1924-25 there seemed every reason to believe that plantings would not be increased for the following year and might very well be decreased further. Figuring on a basis of an average yield per acre and the same acreage in late crop potatoes as in 1924, gave a probable crop of 284,000,000 bushels in 27 late crop states for 1925. With such a crop, an average price of about \$1.90 per hundred-weight would be expected. This would have been about twice the price in 1924 and a decidedly profitable price for potatoes. As a matter of fact, the acreage in the late crop states was

reduced eight per cent below that of 1924¹⁰ while the yield turned out to be twelve per cent above average.

A number of agencies recognized the situation last spring and joined with the United States Department of Agriculture in advising farmers to increase their plantings of potatoes. There are at least three distinct advantages, however, in giving such information in the form of a statement of probable price. First, and most important, it gives the individual farmer a much better basis for forming his own plans. The blanket advice to increase the acreage of potatoes is never generally applicable. There were undoubtedly many farmers who had planted in 1924 all the potatoes they ought to try to grow, or more. At the same time those farmers who might profitably have increased their acreage in potatoes needed to know more than the mere fact that the total United States acreage should be increased. To decide what acreage they, individually, should plant they needed to know what price to figure on.

Another advantage of the plan of stating the price to be expected rather than recommending changes in volume of production, lies in the avoidance of much criticism. Last spring, organized potato growers were bitter in their denunciation of the Department of Agriculture for having recommended the planting of a larger acreage of potatoes. The resentment threatened for a time to break out in an attack on the recommendations contained in the "Agricultural Outlook," which might have prejudiced the continuance of that most useful work. Any recommendation for increased production, with its implication of decreased prices, must be expected to arouse objections from producers; and in a time when sympathy for the farmer is less prevalent, any recommendation for decreased production may be expected to arouse objection from consumers. A statement of the price to be expected, if made without bias and on a sound scientific basis, leaves the decision for increase or decrease in production to the judgment of the individual farmer and disarms criticism.

That the resentment of potato growers over the government

¹⁰ Based on revised estimates issued in December, 1925.

recommendation for increased acreage last spring did not crystallize into a vigorous public attack is to be attributed, in considerable measure at least, to an interesting conclusion reached on second thought by certain representatives of the organized producers. Recalling the apparent effects of agitation for decreased cotton acreage in past years, they concluded that the recommendation for increased planting of potatoes might have a similar reversal in its effect. It is interesting to note that the recommendation of an increased acreage was followed by an eight per cent decrease. Shall we say "because" or "in spite of" the recommendation. The judgment of representatives of the potato growers that the recommendation for increased planting of potatoes might lead in fact to a reduction suggests a third advantage of the plan of stating the facts in the form of an estimate of the price to be expected. Such a statement not only gives the individual farmer a sounder basis for forming his own plans and disarms adverse criticism, but in all probability is much the more effective way of getting the proper adjustment of production.

The plan of stating a specific price which farmers should figure on in planning their production program is feasible, I believe, only on the basis of correlation studies of prices. Probably few, if any, of the agencies which might issue such statements include on their staffs men of sufficient experience and judgment in matters of commodity prices to justify their attempting any such specific estimates without the basis of correlation studies. Even if such men are available there exists no means of sufficiently demonstrating the excellence of their judgment. Public agencies must generally limit themselves to statements capable of demonstration by definite scientific methods.

Given these advantages of the plan of stating a prospective price in a coming season, there remains the question, what degree of perfection must be reached in a correlation study of prices before it may wisely be used as the basis for a statement of the price to be anticipated? The answer depends on the form of the statement to be made. In order to reach a conclusion as to the adjustment of production necessary to meet an expected demand and supply situation three steps

are logically necessary. First we must arrive at a conclusion regarding prospective demand and supply conditions, such as prospective acreage of crops (and, so far as possible, prospective yield per acre), and prospective demand. Second, we must infer from these prospective conditions the expected prices or price changes, and finally judgment must be formed as to the adjustments of production which will prove most profitable with the expected prices.

In practice it is customary either to stop with the first stage, a statement of prospective demand and supply conditions, or to pass directly to the third stage, forming a judgment on the necessary production changes without definitely formulating a statement of the expected prices on which the judgment regarding the production program should logically be predicated. There is a widespread belief that aid to the farmer in adjusting his production program should go beyond the first stage of a statement of expected supply and demand developments. If our information is sufficient to justify going to the third stage of recommending specific adjustments in production, can there be any question that it is sufficient to justify going to the second stage of stating the expected price situation on a judgment of which the recommendation regarding production must logically be based?

The obvious conclusion that a statement of an expected price situation is safer and more certain than a statement of the production adjustment required to meet it, however, does not give a complete answer to the problem in hand. Consider the reasoning involved in reaching the usual conclusion from an expected change in demand and supply conditions. Expecting most farmers to decrease their acreage of a crop or production of livestock, it may be reasoned that the price to be expected next year is higher than the price which was to have been expected last year. From this it follows that the farmer who is awake to the situation may expect to profit by increasing his production over what he should have produced last year. Assuming that he planned his production wisely last year, he may be advised to increase it this year. If the statement of the expected price situation goes no further than this, that prospects are for a higher price this year than could

have been expected last year, it clearly rests on at least as sound a basis as the production recommendation predicated on it. Use of the results of even a rough correlation analysis would permit a still more specific and more accurate statement of the change in reasonable price expectation between the two years.

If possible, however, the price statement should go further and name a specific price to be expected. Mere statement of a change in the reasonable expectation leaves the farmer still in error if he failed properly to judge the price to be expected previously. Correlation studies may contribute much in this direction. Judgments of the price to be expected may be considered as depending partly on a decision as to the influence of expected abnormal conditions in causing the price to deviate from normal and partly on a decision as to what constitutes a normal price, that is, a price to be expected under normal conditions. The latter judgment is at once the more important and the more difficult. The upper curve on Figure 1 shows the data from which the farmer must form his judgment as to the present normal price of potatoes in St. Paul and Minneapolis; the judgment is obviously a difficult one owing to the wide fluctuations of past prices.

The trend of the normal becomes clearer if the influence of the changing general price level is removed, giving the price in terms of purchasing power in dollars of constant value. The second curve on the chart shows the deviations of the actual purchasing power from such a trend of normals as tentatively calculated. Is this trend properly calculated? Should the normals for recent years be lower than indicated or are the low values in these recent years accounted for by deviations from normal of production and other known factors affecting price? The results of the correlation analysis give a very clear answer, for they make possible the calculation of the amount of the effects which have been produced by known factors. When these known effects are removed, certain deviations from the calculated normals remain, as shown in the last curve on the chart. If the calculated normals for recent years were too high, these deviations should be mostly downward in those years. The relatively

small range of the deviations as thus corrected for the influence of known factors gives a valuable check on the reliability of the normals as originally calculated and a basis for correcting them if necessary. Normals so verified are certainly more reliable than the judgments which might be formed by any ordinary farmer.

In other cases it may not be possible to calculate the normal prices for current years with as great a degree of certainty as in the case of potatoes, but it would seem there should be few cases in which a careful correlation study cannot contribute information of value in leading the average farmer to a wiser judgment of the price to be expected under normal conditions. In addition, it permits a statement of a price to be expected which is based on a superior judgment of the probable effects of all such unusual conditions as can be foreseen and possesses the advantages of putting the information in such form as to be least subject to criticism, most useful to the individual farmer, and most effective in contributing toward an economical adjustment of production.

RESEARCH IN THE ORGANIZATION AND OPERATION OF MARKETING BUSINESS UNITS¹

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I think we are agreed that the objective of research in the organization and operation of marketing business units is primarily to promote efficiency in marketing by improving organization and management. Some research may be designed, and it is undertaken at times solely to promote a better understanding of economic processes. New principles may also be discovered or old principles modified as a result of such research. In general, however, such results will be a by-product rather than a principal product of research. One reason for this is that principles of this sort must come largely from production and price analysis. Most actual research in marketing organization is therefore primarily concerned with the analysis of particular market situations and hence with the application of known economic principles to marketing agencies rather than with the development of new principles. This automatically limits the field for discussion in this paper to the gathering of data of actual marketing situations, the method of this analysis, and the use of the results.

Since the chief objective of research in this field is to improve organization and management, much of the data collected and analyzed must be of such nature as will assist individual concerns to formulate better organization plans and operating methods. This means that the business of individual marketing units must be examined in detail. A serious criticism of most of the research in this field up to the present time is that the results are of little use to operators of marketing concerns. Much of the preliminary research has necessarily been to find out how the marketing system functions and to describe its processes. However, this introductory objective has in most cases not been pushed sufficiently into

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 30, 1925.

the background as the research program has proceeded, the result being that today undue emphasis is placed upon marketing services without specifically relating the services to operating efficiency. One needs only to examine our bulletins and textbooks on marketing to understand how remotely they are related to specific management problems.

A good corrective to this point of view is to examine carefully the management problems of the marketing agency before outlining the research project. The case of a proposed creamery is typical. The first and primary consideration of the management is to construct a business unit. The location must be selected and the choice between locations of varying value, accessibility, and attractiveness must be decided upon. The size of the plant and the kind of materials of which it is to be constructed must be determined. Likewise, important decisions must be made as to the kind of equipment to be installed and the completeness of equipment, the amount and grade of labor and management to be employed, methods of financing, and, particularly in the case of large marketing firms, the organization of the personnel.

Having set up the marketing unit, the management must then decide how the business shall be conducted. That is, it must decide upon its business practices. Most of these are related to the buying and selling. Such problems arise as how, when, and where to sell—shall the product be pooled or bought for cash, and, in the case of products for which there is a futures market, shall cash purchases be hedged? To what extent shall the commodities be stored, graded and otherwise handled and prepared for market? Shall the business be conducted independently or shall it become part of a larger marketing business, and if it follows the trend of the times to amalgamate with other similar businesses, how much of its identity shall it give up? These two sets of management problems, as will be explained later, are inter-related.

Much assistance can be rendered to marketing agencies, on the one hand, by applying known principles of economics to specific problems. Price policies, membership relations,

and other similar problems, the kind of problems that most research bureaus have handled most successfully, can be so treated. In fact, much more use might profitably be made than at present of the deductive method of analyzing marketing problems. Statistical verification of a conclusion on such a problem as the effect of hedging on the success of a local grain business would not change the conclusion drawn sufficiently in most cases to warrant the expenses of gathering the data. On the other hand, most organization problems, especially the problems of internal organization, must be studied in much detail. An analysis of these problems obviously requires a large fund of information. Some of the problems require more detailed information than others.

Little contribution, it should be noted, can be made by research to some aspects of organization unless it includes statistical analysis. Take the question of what constitutes the proper size of building for a creamery. No known principles of engineering or economics can give the answer until the relation between utilization and cost to volume of business is known. What is needed is facts. Costs vary with the type of construction because the cost of different kinds of building materials varies and because the depreciation of different kinds of buildings varies. It is the function of research to bring together all the facts on this and similar problems from representative communities and agencies in order that they may be combined with principles already recognized.

Such an analysis of the whole economic background of marketing organization and operation as is here outlined necessarily calls for new methods of collecting and analyzing data. The schedule must in large part supplant the questionnaire and, since records are so poorly kept by most marketing units, especially the small but numerous units, investigators will actually be obliged to complete the records in many instances. Some dealers may be persuaded to keep records better suited to analysis. However, this can probably never entirely take the place of the personal

examination of the business by the investigator, first, because managers are often hesitant in adopting proposed changes in their methods of doing business and, second, because supplementary information needed, such for example as the distribution of the use of the factors of labor, management, buildings, equipment, and the like between the different products or processes, can obviously, from its very nature, be secured satisfactorily only by personal examinations. This statement should not be understood to imply that all data should be gathered directly from marketing agencies by personal representatives. Annual statements of marketing units, reports of trade associations and governmental departments may have valuable information for the research worker in this field. The point is that these sources must be supplemental to the detail information of organization and operation of individual business units.

The large fund of information that is needed for such a research program, especially for the economic organization aspects, has an important bearing upon the method of attack and the scope of individual research projects. There is much to be gained, for example, by organizing the program on the basis of commodities and by undertaking a study of all the types of agencies marketing a given commodity. Thus, in grain marketing, local grain elevators, commission merchants, terminal elevators, and any other grain marketing agencies would be studied at the same time. The conditions under which all related agencies are studied would therefore be sufficiently comparable to permit a close analysis of inter-unit relationships. Only under these circumstances can we most satisfactorily ascertain the most economical agency for rendering such services as storing, cleaning, and the like. One way of overcoming the difficulties of an inadequate staff and the high cost of such an approach is the division of the program among different cooperating research agencies. Another method is to study the different agencies in sequence and to analyze the data in such a manner as to permit of a readjustment of the results to differences in cost rates or other operating conditions under which the different agencies

are studied. Neither of these methods, however, will probably give as good results.

The analysis must also be largely cross-sectional, at least in the beginning, because marketing organizations and the public agencies to which they may report have not kept the kind of information wanted over a period of years. The cross-sectional analysis is of course very valuable, but since conditions any one year may be peculiar in many respects it is highly desirable to have an analysis of the same business units under the varying conditions that are likely to occur over a long period of time in order better to explain the factors affecting efficiency. Ultimately, a series of cross-sectional studies may be completed for a period of consecutive years or for short periods of a year or two at intervals of several years. Already a few such studies are being started as a part of the enlarged research program that is made possible by the Purnell Act.

The order in which the different problems of organization and operation should be studied, and the proper combination of problems should be governed largely by individual circumstances. Ordinarily the inter-relation of management problems makes it advisable to include several such problems in a single project, since much data for one problem are useful in analyzing another. This assumes that the investigators are qualified to study all aspects of management and that they are familiar with the marketing processes with which they will be dealing. If they do not have these qualifications, as will generally be the case, it is advisable to break the analysis into several parts. Let one be a preliminary survey of the whole problem together with an analysis of the business practices that do not require much statistical analysis. Let a second deal primarily with certain economic organization aspects. Let later studies deal with such problems as can not be conveniently treated in the first studies or that may have developed out of new marketing situations. If the investigators are fully qualified to handle all aspects of management analysis, there would be some saving in time by starting with the economic organization analysis and including the analysis

of as many business practices as time will permit. A serious objection to this method of attack is that the study is likely to become so large that it is cumbersome. In most cases, it should be pointed out, there will still be problems of organization and operation that require special consideration.

An important aspect of this type of research is the need for complete analysis of the data. Management can not be improved unless the factors affecting its efficiency are discovered and measured and the reasons for inefficiency are pointed out. The simple method of analyzing data by averages, ranges, and frequency distributions, developed by our prevailing type of research in farm economic studies is insufficient. To illustrate, the average management cost of 111 farmers' elevators in the spring wheat regions in 1922-23 was 1.5 cents per bushel, the range in cost was from less than one cent to over four cents per bushel, and most of the elevators fell within the cost range 0.5 cent to 2.5 cents per bushel. Merely to present these data, however, as averages, ranges, or frequency distributions without pointing out that the reasons for the wide variations are due to differences in the amount of management hired, or the quality of it, as in the salaries paid for the same grade of management, or that high management costs are often due to low equipment cost, is likely to give results of little or no value because they can not be interpreted by business management or extension workers. There is also danger that when such economic organization analysis is combined with a discussion of business practices the product will be a peculiar and uninteresting mixture of description and statistical material with little contact with real problems. Pure descriptive facts and statistics solve few problems.

The second part of the analysis, namely the measuring of relationships, is more difficult. We may offer explanation for different prices received for livestock by various commission firms but we cannot measure the ability of management to sell because we cannot measure the quality of livestock. Some of our data can nevertheless be sufficiently refined to measure with a fair degree of accuracy. Wherever this is possible it should be done. Creamery operators may agree

that the quality of cream is the most important factor affecting the price received for butter. Yet how important is it? The fact that it accounts for 4 cents out of the range of 10 cents actually received by 88 Minnesota creameries is certainly much nearer the truth than the estimate of most creamery operators, making all due allowance for experimental error, and furnishes a much better basis for the reorganization of a creamery business.² This type of analysis sometimes involves statistical methods that will give coefficients of multiple and partial correlation showing the net relationships and coefficients of determination which indicate the relative importance of the different factors. Objection is often made to the use of such statistical analysis in marketing organization. That it can be used to advantage, however, if the data are sufficiently complete has been demonstrated several times.

A word of caution should be given to investigators in the field of marketing organization at this point. They should not forget that research in marketing organization is fundamentally based on economic principles and that statistical method and accounting are merely working tools. Professor J. D. Black in a recent address before the presidents and directors of land grant colleges very wisely called attention to the disposition of research workers in this field to go "statistics mad" particularly in the first years of their research work and for cost accountants to consider each business analyzed solely as an individual enterprise, forgetting that accounting is merely a tool to use in developing data for later statistical analysis. The statistician tends to over-emphasize correlation. The accountant is likely to concentrate too much on sample balance sheet and operating statement results not pointing out the factors affecting efficiency and the methods of increasing efficiency. What we need in such circumstances, however, is not the abandonment of the tools, but their adaptation to economic analysis.

² *Economic Aspects of Creamery Operation*. Minn. Agr. Exp. Sta. Technical Bulletin No. 26. J. D. Black and E. S. Guthrie.

The contribution of research to extension programs and teaching should be mentioned. Extension specialists in marketing are seriously handicapped in helping marketing units with their organization problems and are losing an opportunity to help direct the continuous ever-present changes in their policies simply because economic principles have not been applied to agricultural marketing organization or, if they have been applied, the results have not been presented in such form that they can be used. The fundamental importance of this opportunity can be readily appreciated if one will only list the subjects discussed at boards of directors' meetings or the questions asked of extension specialists. Such lists would include many such problems as: how large a plant shall we build? What size churn shall we buy? Should cleaning and grading apparatus be installed? and the like.

The teaching of marketing has been likewise handicapped. Most so-called courses in principles of marketing organization are only remotely related to the field of production economics to which they principally belong. They include, to judge from the very nature of the text materials available, essentially a description of the marketing processes interspersed with a discussion of business practice. This is of course an important part of a marketing course. However, until the application of the principles of production economics, expressed in such laws as diminishing outputs, combinations of grades of capacity and efficiency, comparative advantage and the like, is made to marketing organization, our divisions of agricultural economics will turn out graduates inadequately trained, either as managers of business enterprises, extension specialists, or teachers and research workers, to analyze some of the most fundamental problems of business activity.

It should be pointed out in closing that research as discussed in this paper is not peculiar to any type of marketing organization. Frequent reference to local marketing units may have left that mistaken impression. The best combination of building, equipment, labor, and management, and the selling methods that will give the largest return are just as important for the terminal elevator as for the local grain

elevator. The terminal elevator is in a somewhat better position to analyze such problems because its business is larger, but it generally has access only to the records of its own business. Impartial investigation is therefore as necessary for the one as for the other if standards by which the efficiency of individual firms can be measured are to be set up.

An aspect of this problem that has increasing significance as governmental regulation of marketing is developing is what constitutes reasonable charges. Fixing rates on the basis of charges in competing markets may serve the purpose temporarily, but it dodges the real issue. Ultimately rates must be determined by an analysis of all the economic factors affecting the service for which the charge is made. Reasonable, as applied to marketing rates, will have to be put upon the same basis as reasonable for railroad and other such rates.

ANALYZING THE VARIABILITY OF CITY DEALERS' MARGINS¹

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For several years the Bureau of Agricultural Economics of the United States Department of Agriculture has been cooperating with the Port of New York Authority in studying the handling and distribution of fruits and vegetables in the New York metropolitan district. One of their joint studies, entitled "Distributing Fresh Fruits and Vegetables in the New York Metropolitan Area," was completed about July 1, 1925. The survey was conducted by Mr. Charles E. Artman, Research Agent in Marketing, Bureau of Agricultural Economics, under the direction of Mr. Walter P. Hedden, of the Port Authority. The material for this paper is being drawn from that investigation.

Mr. Artman's study is primarily an analysis of the price spread between wholesaler and consumer in metropolitan New York. It deals only with a selected group of fourteen leading fruits and vegetables.

"The selection of commodities included articles of major consumption and those having variable marketing characteristics and typical dietary uses. The choice was restricted to such goods as are prevailingly sold by retail stores, and which are sufficiently standardized to admit of ready identification and comparison." (p. 60.)

Retail prices in about fifty stores in the city were recorded weekly for a period of sixteen months ending in May, 1924. Selection of stores was made to include varying types of management, of clientele, and of selling policy in each locality. "A description of each store was placed on file, indicating whether it was a chain store or an independent unit, whether it carried fruits and vegetables in addition to a general line

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 30, 1925.

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of groceries or specialized only in perishable goods, whether the store granted credit and made deliveries, or operated on a cash and carry basis, the classification of its trade as high class, middle class or low price, and finally the jobbing market from which the retailer secured his supplies. (p. 60.) The retail quotations were collected by regularly accredited reporters, principally housewives and representatives of women's organizations in the localities surveyed. These reporters volunteered their services as a matter of public spirit and interest in the project; during the latter part of the study they were paid a small weekly compensation for the time required in collecting the quotations." (p. 58.)

In all, there were about 14,000 individual retail figures. These were classified, converted to standard sized unit equivalents, averaged, and matched with their corresponding wholesale and jobbing prices, to determine the spread under the several classifications. In comparing prices adjustment was made to allow for physical losses in retail selling. The wholesale price quotations were secured from the daily New York market report of the United States Department of Agriculture. Jobbing prices were collected by members of the research staff of the Bureau of Agricultural Economics, in the four jobbing markets, Harlem, Gansevoort, Wallabout and Newark. Without going further into the method of gathering and consolidating the data, suffice it to say that every precaution was taken to make this investigation as accurate as possible. Extreme care was exercised at all stages to insure measurements of marketing phenomena which would lend themselves to statistical interpretation and the formulation of significant conclusions.

Let us consider some of the findings of the study concerning the variability of the city dealers' margins under different sets of conditions as to commodity, type of store management and policy as to credit and delivery. For convenience the city dealers' margin is expressed in cents per consumer's dollar. When all stores are included the following margins are found for the fourteen commodities:

Commodity	City Dealers' Margin (Cents of Consumer's Dollar)
	All Stores
Northern Potatoes.....	37
Southern Potatoes.....	38
California Oranges.....	41
Peaches.....	45
Sweet Potatoes.....	45
Cantaloupes.....	46
Boxed Apples.....	46
Southern Cabbage.....	48
Barreled Apples.....	49
Eastern Lettuce.....	51
Western Lettuce.....	52
Yellow Onions.....	53
Northern Cabbage.....	58
White Onions.....	63
Weighted Mean.....	44.6

The variability of margin from 37 for Northern Potatoes to 63 for White Onions is extremely large and requires explanation. This variability due to commodity differences is greater than that for any of the other factors measured in the study. The question naturally arises, "What different marketing qualities of the fourteen commodities give an adequate explanation of these margin differences?"

Let us digress here for a moment to interpret the meaning of margin differences. The margin on Eastern Lettuce is 51 cents of the consumer's dollar, while the margin for Western Lettuce is 52 cents. The difference is 1 cent. What does that mean? Does it indicate that a consumer who has been buying Western Lettuce can save one cent on the dollar expended for lettuce by shifting to the Eastern variety? Not at all. The use of the dollar's worth of the commodity as a basis is somewhat confusing. The effectiveness of the consumer's dollar spent for Eastern Lettuce, so far as it is influenced by city marketing costs, is really about 2 per cent greater than the dollar spent for Western Lettuce, and not 1 per cent as would first appear. For it is only that portion of the consumer's dollar which is spent for him at wholesale that is productive of merchandise. His dollar buys 49 cents' worth of Eastern Lettuce at wholesale, but only 48 cents worth of Western Lettuce. The relative effectiveness of the two dollars then is

as 49 is to 48, or an advantage of more than 2 per cent in favor of the dollar spent for Eastern Lettuce.

The margin on Northern Potatoes is 37 per cent; on White Onions it is 63 per cent. Analyzing the difference in wholesale purchasing power of the consumer's dollar as was done for the two varieties of lettuce shows the dollar expended for Northern Potatoes to be 75 per cent more productive than that spent for White Onions. To put it the other way, the Onion dollar is only 59 per cent as effective as the Potato dollar. What marketing factors are responsible for this wide divergence as among the several commodities? What is the cause of the apparent inefficiency in the city marketing of one dollar's worth of onions as compared with one dollar's worth of potatoes? We are not here concerned with the absolute costs of marketing within the city, but with the relative costs, one commodity compared with another.

"In seeking an answer to this question, it was suggested that the following conditions might so influence the manner of handling the various articles as to establish the differences that were found to exist:

The amount of the commodity annually marketed.

The total annual value of the commodity.

Specific value per unit of goods.

Regularity of supply.

Relative perishability.

Variability in wholesale price.

"Numerous detailed tests of the data were made to ascertain the extent of the association between these respective commodity characteristics and the percentage margins. In applying the tests a great many comparative tables were constructed and numerous scatter diagrams and curves were plotted to discover if any relationship existed. With some of the suggested characteristics, a limited degree of association was found; but in no case was the relation sufficiently regular or uniform to explain adequately the contrasts in the margins of individual commodities." (pp. 83, 84.)

"It was therefore necessary to seek further for other contrasts in the manner of distributing these articles. The idea was then suggested that variations might exist in the extent of service required for retailing a dollar's worth of each of the different commodities which would suffice to explain the margin differences. It is a self-evident fact that the amount of goods taken at a time by an individual purchaser bears very

little relation to the amount of service and attention required from the retailer. A customer who purchases a very small quantity of goods requires practically as much of the storekeeper's or clerk's time as does the person who makes a large purchase. Hence it is a reasonable supposition that the selling expense per retail sale should be fairly uniform irrespective of its size.

"In searching for a criterion that would be a measure of the possible variations in service requirements, attention was called to the fact that the size of the average retail sale differs materially with different commodities. This variation in size of the retail sale proved to be the key that provided the needed explanation." (pp. 84, 85.)

The difficulty in explaining the variations in margins as among commodities has been due to the use of the retail dollar's worth as a basic unit. The margin is the gross payment for marketing service rendered. If more service is involved in distributing one dollar's worth of one commodity than in distributing one dollar's worth of another, why should we not expect to find the cost of such services appearing in the form of a larger margin for the first article than for the second? Indeed, any statistical survey which did not reflect such an actuality would be misleading to say the least.

Now we shall take a new view of the problem and compute city marketing costs of these fruits and vegetables not on the basis of the consumer's dollar's worth of each, but on the basis

ALL STORES

Commodity	Pounds per Usual Retail Sale	Value of Retail Sale (c)	City Dealers' Margin (%)	City Dealers' Spread (c per usual Retail Sale)
Northern Potatoes-----	6.50	26.7	37	9.9
Southern Potatoes-----	3.75	27.8	38	10.6
California Oranges-----	2.50	27.5	41	11.3
Sweet Potatoes-----	2.75	24.5	45	11.0
Peaches-----	2.25	26.8	45	12.1
Boxed Apples-----	2.25	24.7	46	11.4
Cantaloupes-----	3.25	24.7	46	11.4
Southern Cabbage-----	2.75	25.9	48	12.4
Barreled Apples-----	3.00	24.0	49	11.8
Eastern Lettuce-----	1.75	22.8	51	11.5
Western Lettuce-----	1.50	22.1	52	11.6
Yellow Onions-----	3.25	23.1	53	12.2
Northern Cabbage-----	4.00	20.8	58	12.1
White Onions-----	2.25	20.3	63	12.8
Weighted Mean----	3.28	25.3	44.6	11.3

of the physical quantity which the consumer usually buys at a time. For the sake of uniformity these have been measured in terms of pounds for each commodity, notwithstanding the fact that some of them are not sold by the pound but by the peck, head, or other customary unit. Figures as to the usual size of the retail sale, multiplied by the mean retail price per pound, will give the value of the usual retail sale. Applying the percentage margins to these values will show, in turn, the city dealers' spread in terms of cents per retail sale.

Hence when the price-spread from wholesaler to consumer is expressed in terms of cents per usual retail sale, it is found to have a remarkable degree of uniformity for these fourteen fruits and vegetables, in contrast with the wide divergence when measured as a percentage margin.

Separation of the city dealers' spread per sale into the two parts of which it is composed, the jobber's portion and the retailer's portion, brings to light a tendency towards even greater stability in the retailer's share, as among the different commodities.²

UNIT STORES ONLY

Commodity	Jobber's Spread Per Usual Retail Sale (c)	Retailer's Spread Per Usual Retail Sale (c)
Northern Potatoes -----	1.6	9.2
Southern Potatoes -----	1.7	8.7
California Oranges -----	2.0	9.8
Sweet Potatoes -----	1.8	10.1
Peaches -----	2.5	9.7
Boxed Apples -----	2.7	9.1
Cantaloupes -----	2.0	9.6
Southern Cabbage -----	2.9	9.8
Barreled Apples -----	2.0	10.3
Eastern Lettuce -----	3.0	9.2
Western Lettuce -----	1.8	10.1
Yellow Onions -----	1.6	10.8
Northern Cabbage -----	1.9	10.6
White Onions -----	2.5	10.9
Weighted Mean -----	2.1	9.7

It is found that the jobber's services cost the consumer about 2 cents for each retail sale, and that the retailer's services cost him about 10 cents per retail sale, *regardless of the*

² Note these data are for unit stores only.

commodity. In the aggregate the dealers seem to work to the end that each individual sale bears the same share of the total cost of marketing. Whether it is a 6½-pound sale of potatoes or a 1½-pound sale of Western Lettuce, it must carry the 10-cent charge above the jobbing cost.

This bit of analysis offers a plausible explanation of how retail prices are set. In theory, "retail prices are set at such levels above wholesale prices as will tend to make the spread between wholesale and retail values of the sale the same for all commodities." (p. 130.)

We have now explained the cause of the greatest apparent variability of city dealers' margins, that found among the several commodities. It is traced directly to the consumer's habits of purchasing some commodities in smaller individual lots than others, and to the dealers' insistence that service rendered must be paid for—each sale must pay its own way. The retail price must include the cost of making the sale.

Now how can the effectiveness of the city consumer's dollar be increased? It can come about in two ways, without going back of the wholesale price; either the cost of making the individual sale must be reduced or that cost must be spread over a larger sized sale.

On the first point we have some interesting figures covering efforts to reduce costs of marketing by the elimination of certain services. The chain store system of retailing is one of the best examples. Our computations for chain stores include seven commodities: Northern potatoes, California oranges, sweet potatoes, boxed apples, barreled apples, Eastern lettuce and yellow onions. (The retail value of these seven articles sold in New York in 1923 constituted 70 per cent of the value of the whole series of fourteen.) The weighted average cost of marketing these seven fruits and vegetables through chain stores was only 33 cents per consumer's dollar, compared to 47 cents when sold through the credit-delivery independent unit stores. Properly interpreted, this chain store saving to the consumer is not the difference between these two figures, or 14 cents per dollar. Instead it is 21 cents. To obtain that saving, the customer must pay cash,

carry his goods, and do without some of the other features of unit store service, such as wide range of selection.

When the calculations are converted to a carload basis, there is a startling difference in cost of city marketing in chain stores as compared to credit-delivery unit stores. The city dealers' spread per car for these seven articles averaged \$1,075 in the credit-delivery unit stores. The corresponding chain store cost was only \$570, or a reduction of about 47 per cent. That 47 per cent saving in cost of marketing is synonymous with the 21 per cent reduction in prices which the chain store offers to consumers.

The net influence of chain store management and cash-carry policies has been measured separately. The consumer's outlay per weighted average standard retail sale of these seven articles in several types of stores was as follows:

Type of Store	Consumer's Outlay Per Retail Sale (c)
Chain -----	20.8
Unit Cash-Carry -----	23.8
Unit Cash-Delivery -----	24.8
Unit Credit-Delivery -----	26.8

Any differences in quality of goods have been eliminated in these comparisons; the figures reflect prices for the same quality. Hence the net reduction of marketing cost concurrent with chain store management is 3 cents per retail sale. Likewise, elimination of credit reduces the spread 2 cents, and dispensing with delivery accounts for still another cent.

The suggestion to reduce city marketing costs by spreading the expense per sale over a larger quantity of goods deserves careful consideration. Because of the small size of the customer's purchase, the average retailer in New York City was called upon to wrap up more than 35,000 packages of these fourteen fruits and vegetables in 1923. It has been shown that it is about as expensive to make the small sale of onions as it is to make the large sale of potatoes. Apparently it is the making of the sale that generates marketing costs, and not the size or value of the sale. Small sales multiply the total cost because of their number. Why not reduce the cost of

marketing by reducing the number of individual sales and making each one larger?

On this point the consumer may object on the grounds that such a step would mean the elimination of service. A reduction in the number of retailers in business would probably follow. There would not be a store within a few footsteps of every consumer. The customer would have to plan his purchases to anticipate his needs more than one day in advance. He may be obliged to increase the size of his icebox, pantry or cellar. He would have to assume directly part of the risk of spoilage. That is, the expense might still be there, and it may not be particularly comforting to call it "rent" or "administration" rather than "cost of marketing." However, it does seem clear that if most consumers would consistently buy more of each commodity at a time, the portion of the consumer's dollar that is absorbed by city distribution costs would decrease.

COORDINATION OF RESEARCH IN MARKETING ¹

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The topic assigned me can be discussed from several different points of view.

1. What is meant by coordination of research? On first thought it may mean the bringing together of the results of individual or institutional research. The analysis and then the synthesis of the findings of independent investigators seems to be a fruitful project when applied to studies in the physical and biological fields where many individual scientists have bored into the unknown, each in his own way and in his own place. Many farm management investigations, if the pioneer surveys can be called investigations, were conducted quite independently of each other, although in this case the methods employed were very similar for most of them followed the original copy. Studies in marketing have not yet proceeded very far. Nevertheless one needs only to read the list of marketing projects compiled for the Purnell committees or the list of doctoral dissertations in agricultural economics to be impressed with the very wide range of studies already attempted and completed, under way or proposed. In the interest of scientific accuracy and uniformity and comparability of methods and results, studies bearing on one commodity, service, or institution should be brought together, the methods and results compared, the findings evaluated, the discrepancies and inadequacies pointed out, and new projects outlined to cover fields partially or wholly unworked. Very little of such synthesis has been made.

2. Coordination of research may mean the outlining of market problems within an institution, a state, or a region, or possibly within the nation; the allotment of different parts of the problem for study to different research men or institutions; the general supervision of the studies while under way;

¹ This paper was read at the Sixteenth Annual Meeting of the American Farm Economic Association, held in New York, December 30, 1925.

tabulation of data by some uniform method; and the comparison, editing, and publication of results. To the present time partial coordination of the second type has been accomplished through the agency of the Bureau of Agricultural Economics of the United States Department of Agriculture. Infrequently state colleges of agriculture have cooperated with farmers' organizations, state departments of agriculture, or more rarely with private corporations in individual projects of marketing research. In at least two instances regional research councils have been organized and are beginning to cooperate efficiently. Of these more will be said in a few minutes.

Much of the coordinated effort effected through the Bureau of Agricultural Economics has consisted of more or less unrelated projects undertaken by various agricultural colleges, each of which cooperated with the federal Bureau under a cooperative agreement by which the Bureau contributed certain limited funds to assist in paying the salary and expenses of a local investigator. Sometimes the investigator was provided by the federal agency, the state paying a part of the expenses. The project was frequently initiated by the state, federal assistance being asked—and granted if the project seemed to have more than local importance and funds were available. Since federal funds are limited and dependent on Congressional favor and subject to Congressional scrutiny, it is necessary or very expedient to distribute them over the entire country and to use them to supplement local appropriations. The tendency recently has been to emphasize federal initiative in setting up the project and providing for and supervising the personnel. The selection of the projects is still largely left to the heads of the various divisions within the Bureau who develop many of their research plans independently of other division chiefs. Moreover, service and regulatory functions must hold the first attention of an executive department. Research must therefore take a secondary position.

The result has been a comparatively large number of projects more or less independent of each other bearing on a great number of marketing problems. The individual published

results are by no means of equal value; many are mere surveys which, however useful as starting points or backgrounds for fruitful constructive studies, are certainly not ends in themselves. I fear these surveys have not always been analyzed and compared to determine common problems or reveal related symptoms.

3. Is it true that problems of marketing are regional, national, or international in nature and that statewide or local studies can not be conclusive? In many, perhaps most, of the vexing problems of marketing the answer is "yes." Even the problems of local outlets for products or the adaptation of local production to meet the demands of local consumption must be answered in the light of outside competitors and opportunity costs, which may depend on outside demands for local products of a different sort.

In this connection it is of interest that experiment station directors who for years have been laboring with the problem of cooperative or coordinate research in the field of physical and biological relations of agriculture with little success are now endeavoring to organize themselves into regional groups who will vigorously grapple with coordination of research. From the point of view of available human talent, effectiveness of equipment, economical use of available funds and recognition of the regional character of certain problems upon which they are engaged, they are impelled to work out a scheme of coordinated effort.

4. Another aspect of the subject is what may be called vertical coordination in contrast to horizontal or regional studies. It is very plain that marketing is intimately associated with production and with consumption. Recently in answer to the question, "Where does apple marketing begin?" one member of my college class said, "With the planting of the apple tree." Everyone knows that transportation and storage problems belong to physics and chemistry and biology as well as to economics, social science, psychology, and nutrition. Half a dozen departments of research in an experiment station must attack the problem of marketing milk or eggs or potatoes, if the solution is to be complete.

Coordination in this sense is beginning to make some headway. The effect of such cooperative effort on the investigators is splendid (provided the old line individualist scientists cooperate at all.) The problem appears in a new light and research is often given a new objective. It may be that this cooperation "at home" will precede coordination "abroad."

5. Without arguing the need for coordinating and correlating work already done either by institutions, states, or regions, for formulating comprehensive plans and setting up projects for research by states or regions or for standardizing methods of investigation or measures of social phenomena, the very practical problems of bringing together the research agencies and establishing a basis of cooperation may well be discussed. In the last analysis the scientific value of the results of research depend upon the investigator. Men who can observe accurately, discriminate skilfully, and draw unprejudiced conclusions—and who are enthusiastic in the search for truth must be given every encouragement. Talent of this sort is rare and no form of organization should hamper it. One object should be such a division of labor as will conserve this talent most effectively.

On the other hand, most of the research agencies are service institutions supplied by public funds. The results of research should assist in the solution of human problems which concern the present generation in regard to their interests now or in the future. Since the problems of vital interest are so numerous and the laborers so few, it is inexcusable if the objectives are not defined in terms of immediate service. Market commodities and services are not usually bounded by civil limits. City boundaries may, state lines seldom confine them. At the least, many of the problems are regional. In any case investigation will be promoted and the results will be more valuable if all the agencies within a district or region counsel together and endeavor to formulate a plan of attack.²

² At this point the organization, objectives and activities of the New England Research Council were presented for discussion.

NOTES

THE OUTLOOK FOR RURAL SOCIOLOGY

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A recent report from the Rural Life Section of the United States Department of Agriculture indicates that there are approximately five hundred colleges and universities in this country offering one or more courses in rural sociology. Many Agricultural Experiment Stations also are now planning to carry on research investigations in this subject, and extension work in rural sociology is beginning to develop. Such summary statements indicate that rural sociology has made commendable progress since the Country Life Commission made its report in 1909. There are, however, some matters of importance which rural sociologists and other persons interested in rural welfare will need to think about if the subject is to continue its development and make the contribution to human knowledge which may logically be expected of it.

There is still a rather widespread though unfounded belief among college students and teachers that rural sociology has special relationship to the farm and that it is intended primarily for those who plan to live in the country. This impression is unjustified today, however, because, first and foremost, rural sociology is a study of rural life in its theoretical as well as its practical aspects. A knowledge and synthesis of facts and theories relating to rural life is essential to a well-balanced education, no matter where the student expects to live. According to the United States census for 1920, approximately forty-eight per cent of our total population is still classed as rural. Surely such a large part of the population warrants careful thought and study. It is difficult to imagine how there can be intelligent cooperation between the farm population and other groups in society if a large percentage of any group is unfamiliar with social conditions in rural communities, or is unable to interpret the conditions which are observed, in the light of sound economic and social theory. Instruction in rural sociology needs to be presented in such a way that it orientates students in the subject and trains them to think accurately and constructively about the problems relating to rural life. Careful teaching, which will emphasize these objectives, will do much to clarify the ideas that are now extant about the purpose and scope of this subject.

At the present time research work in rural sociology is in a rather peculiar position. The time is at hand when persons interested in rural life realize, as never before, the need of sociological facts to help them in formulating constructive programs for rural development. Quite naturally leaders are turning to rural sociologists and to agricul-

tural colleges for such facts. But a large body of facts about rural life is not at hand. Many conditions have contributed to the paucity of such information. Heretofore, relatively little money has been spent by Experiment Stations for research work in rural sociology, and few research workers have been employed. Now, however, a different set of circumstances exists. More money is being made available for research work through funds provided for in the Purnell Act, but in many cases there are not enough trained investigators to^o carry on such projects. Such a scarcity of trained investigators is a temporary matter though, for as soon as prospective men can be reasonably certain that their services will be needed and paid for, they will prepare themselves for this work.

A more serious problem in connection with research work is to convince persons who are not familiar with methods of investigation in sociology that research work is highly important and is needed just as much as research in any subject relating to agriculture. It is just as illogical to expect results at once from research work in rural sociology as it is to expect immediately useful and practical returns from investigations in plant breeding or in livestock production. Furthermore, the problems which arise in connection with the study of rural populations cannot be solved by work in a laboratory. Field investigation and statistics must necessarily be used to a large extent. It is quite possible that considerable time and money will have to be spent in developing ways and means to study rural social conditions in a scientific manner. Nevertheless, these facts do not justify any delay in starting research projects, because the difficulty of a task is no necessary criterion as to whether it should be undertaken or not. The human factor is paramount in agricultural production, and the quicker it can be understood the sooner readjustment and improvement in farm life will be achieved.

Another handicap in rural social research arises from a lack of data. The rural economist, for instance, has had a large amount of statistical data at his disposal for some time. The rural sociologist has not been so fortunate. There are available relatively few data about farm populations in either governmental or private sources. An investigator can find more information in the United States Census about farms, crops, and livestock than he can about farmers and farm families. Furthermore, the data classed as "rural" cannot be used in certain investigations because they do not relate strictly to people living on farms.

It is to be hoped that future census schedules and tabulations may give much more information about the farm people. Having such data available would do much to put research work in rural sociology on a firmer basis than it has been in the past. In the meantime there are much-needed studies which can be made. The "economic and social aspects of modern transportation" have not been investigated. Rural

leadership is not well understood and deserves careful study. The human contacts in rural communities, both of a direct and indirect sort, need to be scrutinized from the standpoint of number and variety, as well as from their effect upon rural attitudes. The cause and prevention of ill-health in the country will bear careful observation and analysis. These and many other problems need to be studied if the social conditions in rural communities are to be well understood.

Extension work in rural sociology has just begun, but in some respects it is the most important phase of the subject. It is through extension service, chiefly from agricultural colleges, that the methods and plans for rural improvement which have been worked out by careful research and study will eventually be brought to people living on farms. Some persons may argue that the subject matter of rural sociology is not yet sufficiently developed to justify the expenditure of funds for this kind of work. But such an assumption is hardly justified. Take again the case of plant or animal production. There is no hesitancy in employing extension workers in these fields, even though new results from research work in plant and animal production are being made available constantly. Conditions are substantially the same in the field of rural sociology. There is enough knowledge of a scientific character relating to community development now available to change completely the social conditions in thousands of localities, if only it were understood and used by the inhabitants of these places. The specific purpose of extension work is to disseminate such information and persuade people to use it.

Rural sociology is rapidly making a place for itself in normal schools, agricultural colleges, and universities. Whatever impediments it now faces are those which are more or less inherent in the development of any subject and do not presage any fundamental difficulty. It is only a question of time until the efficacy of rural sociology in moulding rural social policies will be more fully realized and more urgently demanded.

THE GROWER-CONTROLLED POOL OF THE CALIFORNIA RICE GROWERS

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Among current endeavors to improve agricultural conditions through better marketing methods, the experiment of the rice growers of California seems to hold so much promise as to deserve careful attention. The extent to which the marketing methods of the rice growers could be adapted to other commodities, particularly grain, is problematical. However, since rice like wheat and barley is sold on world valuations, methods which have proved adequate for rice may conceivably contribute something that is useful to the improvement of methods for marketing other grains.¹

The history of rice in California may be briefly stated. In 1908, Mr. Charles E. Chamblis of the Office of Cereal Investigations was sent to California to experiment on the possibilities of commercial rice growing.² Later the Biggs Rice Field Station was established by the United States Department of Agriculture in cooperation with the Sacramento Valley Grain Association, to carry on further investigations. With this encouragement, 1,400 acres of rice were planted in 1912. As soon as the Sacramento Valley farmer, who had been raising hay and grain, realized that his land could be planted to rice that would bring a larger profit, rice was immediately planted.³ From 1912 to 1917 the acreage increased from 1,400 to 80,000 acres. The peak was reached in 1920, when 162,000 acres were planted and harvested. The normal planting now averages about 100,000 acres.

The Pacific Rice Growers' Association which was formed in 1915 as a cooperative sales agency, early appealed to the rice growers as the simplest and most direct method for disposing of the crop. It was based upon a one-year contract which gave the association exclusive agency powers for the sale of the rice of its members and which reserved to the grower the right to accept or reject all bids on his rice. The system of selling "was equivalent to a public auction" in Sacramento, the natural market for the homogeneous rice district.⁴

¹"To procure the highest possible net returns to California rice producers at this time, the Association must find a market for approximately seventy per cent of our crop outside of Continental United States." President's Annual Report, 1925 Year Book, Rice Growers' Association of California, p. 3.

²Jenkin W. Jones, "Rice Experiments at the Biggs Rice Field Station in California," U. S. Department of Agriculture, *Bulletin 1155*, p. 2. 1923.

³The increase in value of a rice crop over the value of a grain or hay crop was necessarily sufficient to cover much higher cultivation and irrigation costs entailed in the growing of rice.

⁴"California rice is practically confined to the Sacramento Valley. In this valley, it is limited toward the south by the cold winds coming through the gap in the Coast Range, and toward the north by the absence of much suitable land. As a really important crop, it is confined to Butte, Glenn, Colusa, Sutter, Yuba, and Yola Counties. . . . The San Joaquin Valley has suitable land and climate, but not water." Edwin Bingham Copeland, *Rice*, p. 166, 1924.

In 1921, curtailed demand and over-expanded supply brought on by the post-war boom, in combination with excessive rains, which had injured the quality of the 1920 crop, caused a partial collapse of the Association. The rice growers attributed a large share of their difficulty to the unstable form of their marketing organization. They called in Mr. Ralph P. Merritt, an experienced business man, and gave him ample power as President and General Manager to reorganize the association. The new or present association organized as "The Rice Growers' Association of California," with a five-year grower's contract to insure permanency for a more centralized management. It was based on the ownership of the land, and any owner of land who joined the association automatically marketed all rice through the association at any time the land produced rice.⁵ District associations and a system of district field agents were to maintain points of contract between the grower and the association.

One of the questions facing the new management was the advisability of an orderly marketing plan whereby predetermined parts of the crop would be put on the market at certain intervals. The officials of the new association reasoned that such a system was impracticable because the association could not control a sufficient proportion of the total supply to influence the market, even were all the California crop controlled.⁶ The policy of the old association of leaving the decision of when to sell to the grower was, therefore, incorporated into the new arrangement, the association making the point that the grower could market his rice in an orderly fashion if he should so desire.⁷ The new arrangement made no attempt to pool the crops of various members, but provided that each member's rice should be sold as a separate lot. The title was to pass from the member to the association, but simultaneously the member of the association was to retain "the right to fix in his contract, and to have the option of later modifying, the minimum price which he would accept for his own rice."⁸ The association was to receive bids for each specific lot of rice, and whenever the highest bid represented a fair value upon world market conditions and met or exceeded the mini-

⁵ Approximately seventy-five per cent of the rice land was thus signed up. The Association has had some annoyance on account of lessees farming lands belonging to members, claiming that they were not bound to market their rice through the Association. A new clause in the marketing contract has been suggested to remedy the difficulty. *Market Letter*, Rice Growers Association of California, January, 1925.

⁶ President Merritt later stated, "It was necessary to set up fundamental principles which could guide an industry merchandising a commodity which represented less than one-half of one per cent of the world's market values. . . . Therefore, price fixing had no place in the program of selling the rice crop, since there was no monopoly and since the crop must move upon values fixed by world movements." *First Annual Report*, Rice Growers' Association of California, July, 1922.

⁷ In the March, 1922, *Association Grower* bulletin the statement was made that "as a matter of general policy, it is usually wise to divide one's holdings into three or four parts and sell portions at different times in order to obtain the average range of the market."

⁸ Each member upon the delivery of his rice has the right to name the minimum price he will take for his crop, and later to change the minimum upward on ten days notice, and downward on immediate notice. *Third Annual Report*, July 1924, p. 4.

mum fixed by the member for that lot of rice, the association was to sell, the rice to be delivered from the warehouse where it was located.*

Before the formation of the new association, the old association had set up a "rice exchange" at Sacramento, where bids and offers could be made. The new association retained and perfected this exchange. All rice millers and dealers who assented to the rules of the Rice Growers' Association were invited to become members of the Exchange.¹⁰

The procedure of selling as it has been worked out, now appears very simple. Since the owner of each sample has the privilege of determining the minimum price that he will accept, only that rice that has a price set by the grower in the range of the demand prices for that day is displayed for sale. Table samples of these rices, drawn by a representative of the association as soon as possible after the rice has been warehoused, are made available for inspection from 8 a. m. to 1 p. m. on sales days, which at present occur at stated intervals during the selling period. The sealed bids of the dealers are submitted to the association not later than 1 p. m. The bid is either confirmed or rejected, depending upon the relation of the price offered to that set as a minimum by the grower. Should the bid be accepted, the buyer fills out a sales contract which provides the terms of the agreement, a description of the lot of rice, its price and quality, and its method of delivery.¹¹

A marketing program of this nature rests upon the theory that the seller will be able to sell to his best advantage on a free competitive market, and clearly depends upon two factors. First, it is necessary that the grower know world valuations of rice and that he act intelligently on this information. Second, it is essential that the grower be able to secure advances on his crop so that the financial pressure of his operating expenses will not force him to dump his crop indiscriminately on the market. Both of these factors have received attention. The growers have been informed upon all phases of the rice market and the problems faced by the association, through a member bulletin service and market letter which secures for the membership the latest and most reliable statement of supply and demand conditions at present available. The market letters are based upon market information gathered from the trade and from association research upon the rice industry. In this work the association has had

* *First Annual Report, 1922, p. 5.*

¹⁰ The most important stipulation of the association rules dealt with the purchase of non-association or disputed rices. The rules stated "Members hereof shall not purchase non-association rice on 'warehouse receipt' or 'round,' or upon sample with grading more favorable to the seller than those currently in effect on this Exchange."

¹¹ "Delivery is taken as soon as practicable after purchase. Payment in full is made at time of delivery. If delivery is not taken within fifteen days after purchase, two-thirds of the selling price becomes due and payable and the full amount becomes due at the expiration of twenty days." *1925 Yearbook, Rice Growers Association of California, p. 5.*

the assistance of frequent reports on rice in foreign markets, published by the Department of Commerce."¹²

In 1923, President Merritt, in his report to the members of the association, made the following statement on the success of the policy. "The past year's experience of this association, with almost no carry-over and with conspicuously accurate absorption of all favorable price peaks, indicates that our members only required a source of adequate information, interpreted and condensed to meet their needs, and an unfailing distributive channel through which they might act, in order to supply soundly, for the most part, the sales decisions of the rice each produced."¹³ The 1924 report further asserted that "the success of the 'minimum' system is based upon the regular weekly market letters which continuously inform the members accurately upon the condition of markets and the opportunity for sales."¹⁴

The financing of the rice grower has likewise been satisfactorily cared for. At first this was done through the War Finance Corporation, whereby under the security of warehouse receipts the association was enabled to borrow for the grower \$1.25 for each bag of one hundred pounds of paddy rice, and latterly through the established banking system.¹⁵ The use of an assignment order system makes it possible for the grower to secure loans of banks and merchants before harvest or delivery by assigning the proceeds of the crop.¹⁶ The procedure of the association in handling assignments is explained as follows by the present president of the association, Mr. E. L. Adams:

"The assignment orders are forwarded to the office and listed in the order in which they are received. The duplicate copy is retained by the association and the original returned to the assignee, showing the amount of outstanding assignments against the rice in question. When a loan is secured against the grower's rice all assignment orders are paid from the proceeds of the loan. If there is a balance after the payments of assignments, it is forwarded to the grower. If the loan does not pay the assignments in full, then the balance of the assignments are paid when the rice has been sold."¹⁷

Although the association has not attempted to develop a standardized product in the manner of other California cooperatives who are organized on a commodity basis, it is the attitude of the association that "by selling each lot separately, on a minimum fixed by the grower, and by the analysis and dissemination of information relative to prices

¹² *Third Annual Report*, Rice Growers Association of California, July, 1924, p. 4.

¹³ *Second Annual Report*, Rice Growers Association of California, July, 1923, p. 6.

¹⁴ *Third Annual Report*, Rice Growers Association of California, July, 1924, p. 4.

¹⁵ Not all growers are able to get financial assistance to enable them to hold for the best prices. To accommodate these growers, the association borrows from the Federal Intermediate Credit Bank. Warehouse receipts are given as security providing they are issued by a warehouse operating under either the State or United States Bonded Warehouse Act. Advances for the 1924 crop were made at the rate of five per cent, and were limited to \$1.50 per bag of one hundred pounds. *1925 Yearbook*, Rice Growers Association of California, pp. 4-5.

¹⁶ "More than \$1,500,000 of these orders passed through the hands of the association for the year ending June 30." *1925 Yearbook*, p. 5.

¹⁷ Personal letter, December 20, 1924.

which various types and differing qualities have brought, there is being built up an understanding of the economic worth of carefully produced and expediently selected types." This policy has caused the standardization work to be considered one of the most important parts of the marketing system, and only recently, after much experimentation, have standard grades been established that are fairly satisfactory.¹⁸

Lots of rice are now sold on the basis of samples drawn by employees of the association. It is assumed, however, in selling a sample that the lot represented by the sample contains some superior and some inferior grades, and that the quality of the lot cannot be shown accurately by one grade. For that reason a "deduction and elimination schedule" has been developed to assist in adjusting such differences. A confirmation of the association's grade on all samples used as a basis of sale or adjustment is secured through a California State Department of Agriculture paddy rice inspection certificate.¹⁹

In summing up this brief study of the marketing methods of the Rice Growers' Association, of California, it is necessary only to point out their simplicity and directness.²⁰ The crop, although dependent upon a world market, is marketed in the locality in which it is grown, in a way to insure each man a price based upon the value of his product under world-wide conditions. The Rice Growers' Association, of California, does not attempt to control the acreage, or to fix the price, except under exceptional circumstances,²¹ but attempts rather to encourage a product worthy of a good demand and to market it with a method calculated to secure the highest return to the grower.

¹⁸ Interview at association offices with Mr. Fagan, Sales Manager, Sacramento, December, 1924.

¹⁹ 1925 Yearbook, Rice Growers Association of California, p. 10. Also, see p. 9.

²⁰ This paper has considered only those arrangements essentially distinctive of the rice marketing system. Other functions of the association which are concerned jointly with the marketing and production of rice, are found in provisions for blanket insurance rates, seed distribution, labor policies, and supply purchasing.

²¹ Prior to the 1924 harvest the demand for rice was strong, tempting growers to sell for future delivery. The association did not wish to have growers sell at prices lower than warranted by supply and demand conditions, so fixed an association minimum of \$3.00 per hundred pounds on all bids that would be accepted by members. In this way the rice buyers were forced to pay a fixed price for the future commodity.

BOOK REVIEWS AND NOTICES

The Management of the Farm, by Llewellyn A. Moorehouse.
New York; D. Appleton and Company, 1925. Pp. xvii
+ 517.

This book was written—as stated by the author—“to assemble facts . . . of direct benefit to the man who is engaged in the management of the farm,” as well as the student of farm management. Part I, dealing with “Conditions which Modify and Control the Organization and Operation of the Farm,” includes discussion of most of the important factors which determine types of farming, but the treatment on first reading seems general rather than exhaustive. Part II, devoted to “Farm Organization and Operation,” is the strong contribution of the book. In this section the writer shows his intimate knowledge of farm practice throughout the United States. Excellent use is made of general and specific data in setting forth the organization and operation of farms in different regions, the types discussed being selected on the basis of the principal crop, class of livestock, or livestock product produced. Farm practice in different areas is set forth in an excellent manner. Part III, devoted to “Economic Problems Confronting the Farm Operator,” while treating in a good way the problems discussed, seems not to include all of the important economic problems which the successful farm operator must meet.

Teachers of farm management may differ in opinion as to whether the proper classroom approach to the subject is obtained through placing emphasis upon the teaching of economic principles of production which may be applied to farm organization and operation in any region, or through a careful study of many different types of farms. The student desiring to be equipped for analyzing the adaptation of the organization and the efficiency of the operation of an individual farm may feel the need of special emphasis on economic principles and methods of applying them to the analysis of the farm business, even to the extent of giving less attention to regional or farming type comparisons. In other words, one would expect

more specific help in farm business analysis, especially as regards the interrelation of enterprises and standards of accomplishment. On the other hand, the lay reader who is operating a farm may receive benefit from a study of separate types of farming, especially the type which he is following himself, and he will probably interest himself in only a general consideration of the principles involved and the factors affecting the organization and operation of farms throughout an entire region. As one reads the text, his conclusion is that this book more fully meets the desires of a layman than the needs of the student.

The writer is to be commended for his presentation of data. The presentation of census data on the county comparison basis offers quite an accurate means of depicting different farming types. Also the presentation of cost data in terms of physical quantities provides data which will always remain useful.

H. C. M. CASE.

University of Illinois.

A History of Agriculture, by N. S. B. Gras. New York; F. S. Crofts and Company, 1925. Pp. xxvii + 444.

During the past six years a considerable volume of literature has appeared upon agricultural history. This is in keeping with the increasing interest in the agricultural industry. It will do much to help us in developing a clearer view of the place of agriculture in the life of the nation. *A History of Agriculture* by N. S. B. Gras is a contribution to this rapidly growing but still much neglected field.

Written by an economic historian, the book attempts to analyze causes and effects as well as to picture the conditions. As stated by the author, "Our concern is with the changes in rural methods throughout the ages. This leads us, not into minute studies of a past century's special problems, but into a consideration of the general steps that the cultivator has taken upward in the march of progress." Certainly an ample field for development. A central theme of the book is the influence of a growing urban population upon agricultural methods and outlook. In the chapter on "Roman Agrarian

History" is a discussion of whether Rome fell because agriculture declined or agriculture declined because Rome fell. The author is inclined towards the second view.

An interesting chapter is that upon "The Early Stages of Agriculture," in which the author outlines six stages in the development of our present field system. To the general reader this will do much to clarify and classify the scattered literature on the subject. Chapters are devoted to the evolution and organization of the manor, to the enclosure movement, and to "Peasant Revolts." In the chapters on "Metropolitan and National Economy in England," and "The Physiocrats," consideration is given to that subject of increasing interest, namely a national agricultural policy. Not the least notable feature of the book is the list of notes and references at the end of each chapter, some to original data but more to recent literature.

J. I. FALCONER.

Ohio State University.

False Education in Our Schools and Colleges, by Emil O. Jorgensen. Chicago: Manufacturers and Merchants Federal Tax League, 1925. Pp. 192.

This book is of passing interest, chiefly as an introduction to the purposes and methods of a rather large group of aggressive propagandists. Most of its contents appeared in the monthly bulletins of the League from July, 1924, to November, 1925. Widely advertised as an "expose" of Professor Ely and the Institute for Research in Land Economics and Public Utilities, it is actually an exposure of the League and the author.

The League has a message to lay before people of this country but, instead of addressing itself to the task and arguing its case on its merits, it has permitted its Director of Information to bury its message under a mass of abusive language filled with gross misinterpretations. The League has a large organization and a growing clientele. Its purposes are laudable, even if its present proposals seem unacceptable or weirdly impractical. The field of taxation is open and needs diligent cultivation. The League and the Institute which it attacks represent two schools of thought, each of which may make signifi-

cant contributions to the problem. This book is a damage to its cause.

The purposes of the League, organized in 1919, are stated to have been: "(1) to carry on a general campaign of education showing why all taxes burdening human industry should be gradually abolished; and (2) to draft a Federal tax bill that would take the first sane and practical step in this direction." The book is a feature of the "general campaign of education." The Ralston-Nolan bill (later the Keller bill) was the tax bill referred to. The League undertook to distribute 3 to 5 million pamphlets and circulars and to maintain a publicity department with the expectation that it could thereby overcome whatever opposition to the Ralston-Nolan bill might arise.

The opposition was more effective than was anticipated. In casting about for reasons why the people, through Congress, did not swallow its measure whole, the League decided that the "vested interests" were frantic with fear that the measure would pass and had set up an ingenious institution to establish their position, and thereupon it undertook to slay the "octopus." A few passages from the book will serve to illustrate the author's state of mind. After noting that the first wave of opposition seemed to weaken he says, "consternation again seized the 'vested interests' . . . The proposal for a great educational organization outside of a public institution was abandoned, and in October, 1920,—just one and a half years after the committee of Manufacturers and Merchants had begun its work—the Institute for Research in Land Economics and Public Utilities with Professor Ely as Director was founded in the State University of Wisconsin . . . One of the first tasks of course, after the formation of his Institute was to deal the death blow to the Ralston-Nolan bill . . . Professor Hibbard proceeded at the instance of Professor Ely to write the desired analysis of the Ralston-Nolan bill. Needless to say Professor Hibbard's monograph was a masterpiece of economic error and absurdity . . . Professor Hibbard went out of his way and stooped . . . to outright misrepresentation." Thereafter follow page after page in the same vein.

The bulk of the book is devoted to setting up and demolishing 32 propositions alleged to state Dr. Ely's position on the points involved. All are "proved" to be "fallacies," if one accept the arguments. Numerous quotations are adduced in support of the author's claims, but they don't help much. The line of argument reminds the reviewer very much of the syllogism which proves that every cat has three tails.

S. W. MENDUM.

Bureau of Agricultural Economics.
United States Department of Agriculture.

BULLETINS AND PERIODICALS

Prepared by Mary G. Lacey

A Discussion of Tobacco Acreage Reduction in the Connecticut Valley, by I. G. Davis and Allen Manchester, Connecticut Agricultural Extension Service, Bulletin No. 94.

Cooperative Marketing of Livestock in Nebraska, by Harold Hedges and H. C. Filley, Nebraska College of Agriculture Bulletin 209.

The purpose of this bulletin, the authors say, is to describe the local cooperative livestock marketing organizations in Nebraska, to present an analysis of the marketing costs of such agencies, to discuss their shipping practices, to explain their business methods, and to present some of the more important problems confronting them.

Economic Aspects of Local Potato Warehouse Organization, by John D. Black, Budd A. Holt, and George M. Peterson, Minnesota Agricultural Experiment Station, Technical Bulletin 28.

This bulletin deals especially with the problems of organization of local potato warehouse units as distinguished from the problem of operating and managing such units after they are set up. It considers only the economic organization. Conclusions and data should be of use in planning new warehouses and reorganizing the present ones upon more efficient lines, the authors say.

Management Problems of Farmers' Elevators, by H. Bruce Price and Charles M. Arthur, Minnesota Agricultural Experiment Station, Bulletin 224.

This study was made in cooperation with the federal Bureau of Agricultural Economics. The object of the bulletin is to discuss the practices of farmers' elevators and to point out the elements of strength and weakness in farmer elevator operation. Data for this study were secured chiefly from annual audits of over 100 elevators covering the marketing seasons 1917-18 to 1923-24; from commission merchants at Minneapolis; and from interviews with 55 elevator operators in Minnesota. The management problems of Minnesota elevators are given special consideration.

Cooperation in Marketing Washington Farm Products, by E. F. Dummeier, Washington Agricultural Experiment Station Bulletin 194.

Sections of the bulletin are devoted to discussions of what is marketing; what is cooperative marketing; what are the different types of organizations for cooperative marketing; what can cooperative marketing do to benefit Washington farmers; what are some things claimed for cooperative marketing which in fact it cannot do; what are the present cooperative organizations for marketing Washington's agricultural products, how do they operate, and what have they accomplished; cooperative organizations for marketing eggs and poultry products; cooperative organizations for marketing dairy products; cooperative organizations for marketing fruits and vegetables; and cooperative grain and hay marketing organizations. Individual organizations are discussed as well as general phases of the work.

The Trend of Real Estate Taxation in Kansas From 1910 to 1925, by Eric Englund, Kansas State Agricultural College, Bulletin 235.

The purpose of this study according to the author is to show the trend of taxes relative to selling values of farm and city real estate in Kansas and to measure the cause of the increase in real estate taxes. Selling value is used as a basis for show-

ing trends, since "true value in money" is the legal basis of assessment and taxation in Kansas. Sections are devoted to the trend of taxes on farm real estate; the trend of taxes on city real estate; farm and city real estate compared; and conclusions. An appendix shows methods of calculation and gives supplementary statistics.

Economic Studies of Dairy Farming in New York, IV. Grade B Milk With Cash Crops and Mixed Hay Roughage, Crop Year 1921, by E. G. Misner, Cornell University, Agricultural Experiment Station, Bulletin 441.

This bulletin contains a report on studies made by the New York Station in cooperation with the federal Bureau of Agricultural Economics. It takes up the farm organizations studied, farm receipts, farm expenses, labor incomes, costs and returns in producing milk listed in detail, raising heifers, organizations of the business, and other factors.

Economic Studies of Dairy Farming in New York, V. Cheese-Factory Milk, by E. G. Misner, Cornell University, Agricultural Experiment Station, Bulletin 442.

This bulletin reports on a study made by the New York Station in cooperation with the federal Bureau of Agricultural Economics. It outlines the conditions in the region and on the farms studied, and discusses farm receipts, farm expenses, costs and returns in producing milk, and other factors in the production of milk for cheese-factories.

An Economic Study of the Agriculture of the Connecticut Valley, I. Production, Supply and Consumption of Connecticut Valley Tobacco, by Frederick V. Waugh, Connecticut Agricultural Experiment Station, Bulletin 134.

The Connecticut Station has undertaken a comprehensive study of agriculture in the Connecticut Valley. This bulletin is the first of a series dealing with the various phases of this study. Cigar consumption has fallen off and production in the Connecticut Valley increased resulting in the piling up of stocks and poor market conditions. This report gives the results of a study of the details of this situation. It contains a number of charts and graphs.

NEWS NOTES

S. W. Mendum, Editor

The economic survey of the agriculture of the New Orleans trade area, comprising the state of Louisiana and the southern half of Mississippi has been completed. The New Orleans Association of Commerce, Louisiana State University, and Mississippi A. and M. College were the principal cooperating agencies, with a representative of the federal Bureau of Agricultural Economics having general direction of the survey. Results of the various phases of the survey will appear soon in publications from each of the local cooperating agencies.

A study similar to the economic survey of the New Orleans trade area is now under way in the state of Idaho under the general direction of a representative of the federal Bureau of Agricultural Economics, cooperating with the Idaho Department of Agriculture and the University of Idaho. Study is proceeding along five lines:—(1) the production and marketing of Idaho farm products, (2) the consumption and distribution of farm products in home markets, (3) the consumptive requirements outside the state and the extent to which Idaho producers are meeting them, (4) the competing producing areas outside the state, and (5) a determination of the highest profit combinations of farm enterprises in the state.

The coming summer will see the beginning of a thorough study of the apple situation in the Shenandoah-Cumberland region. Plans provide for doing special phases of the work each year for several seasons. Scientists in various fields of research will contribute to the findings, which should represent the best of available thought on the subject. Virginia, West Virginia, Maryland, Pennsylvania, and the United States Department of Agriculture are cooperating in this project.

Climatic hazards will be attacked this year. The frost hazard is one of the most serious problems with which growers of this section must contend. Temperature records of the Weather Bureau and phenological data of the Bureau of Plant Industry, supplemented by a large number of observations in the field covering the relation of yield of apples to varied topo-

graphic and climatic conditions, will form the basis of the first report. Other factors affecting yield, such as type of soil, method of culture, spraying, and varieties of apples will be correlated with the frost data.

The field work and analysis will be done by men of wide experience in apple production problems. Dr. S. W. Fletcher of Pennsylvania, Dr. A. J. Dadisman of West Virginia, Dr. S. H. DeVault of Maryland, F. J. Schneiderhan of Virginia, and C. R. Swinson of the Bureau of Agricultural Economics will be actively engaged in the field work.

A regional study of the range livestock industry in the Northern Great Plains for the purpose of determining practical modifications that will increase the ranchmen's net return was inaugurated on January 1. The study is being made cooperatively by the Montana, North Dakota, South Dakota, and Wyoming Experiment Stations, the Division of Animal Husbandry, and the Division of Farm Management and Costs of the United States Department of Agriculture. Sixty representative ranches in the region have been selected for study and observation. Basic cost data on each ranch are being obtained in the form of physical quantities and current cost rates. The factors effecting the percentage calf crop, experience with spayed heifers, the possibility of reducing losses, and the practicability of feeding hay and grain on the ranches are receiving special attention. The directors of the four Experiment Stations and the heads of the Division of Animal Husbandry and the Division of Farm Management and Costs of the federal Department of Agriculture have been designated as the leaders of the project. They have chosen Director Linfield of the Montana station to act as project supervisor. Mr. M. B. Johnson, formerly of the North Dakota Extension Service, will spend his entire time in the area as field investigator.

The American Institute of Co-operation and the summer school of the University of Minnesota are offering jointly an exceptionally strong course in co-operative marketing this summer. Graduate and advanced undergraduate students may carry three courses selected from a list of 12 titles in this

general field, or may combine one or two subjects in co-operation with production economics or other subjects offered in the University summer school. The titles of the courses in Co-operative Marketing are as follows: "Price Analysis and Policies," "Cooperative Marketing Organization," Cooperative Marketing of Livestock," "Cooperative Marketing of Dairy Products," "Cooperative Marketing of Grains," "Membership Control," "Cooperative Administration," "The Economic and Legal Foundations of Cooperation," "History and Progress of Cooperation," "Cooperative Accounting," "Sales Promotion," and "Conference." The men in charge of these courses are Holbrook Working, John D. Black, Paul L. Miller, John T. Horner, H. Bruce Price, O. B. Jesness, E. G. Nourse, Hector Macpherson, Frank Robotka and Theodore Macklin, assisted by other members of the staff of the University of Minnesota and prominent co-operative officials and managers.

Students attending for the whole four-week period of the Institute of Co-operation will receive two-thirds of the regular summer session credit or may continue to the end of the summer session term of six weeks and obtain full credit. Arrangements will also be made in special cases for giving one-third of a full term's credit for persons registering only for the first or the second two weeks of the Institute session. In addition to the regular University class periods the addresses and round tables of the Institute program run from 10:30 to 12:30 and 2:00 to 5:00 daily except Saturday afternoon, with about two evenings a week devoted to lectures by speakers of national prominence. There will also be numerous visits to co-operative plants in or near the Twin-Cities, smokers, and various forms of recreation.

The fourth annual meeting of the National Council of Farmers' Cooperative Marketing Associations was held in Washington, January 12-15, 1926. It developed a clear-cut division between those who were anxious to promote active measures for dealing with the problem of the "agricultural surplus" and those who believed that legislative efforts were futile and that attention should be concentrated on the improvement of co-operative organization and operating methods. A rather spirited debate between these two groups led to the appoint-

ment of a special committee to study the whole surplus problem. This committee is made up as follows: Allen Northington, general manager, Alabama Farm Bureau Cotton Association; C. O. Moser, general manager, American Cotton Growers Exchange; J. C. Stone, president and general manager, Burley Tobacco Growers Association; C. A. Norwood, president, Tobacco Growers Cooperative Association; L. Gough, president, Texas Wheat Growers Association; W. H. Settle, director, Indiana Wheat Growers Association; A. R. Rule, general manager, Federated Fruit and Vegetable Growers; and Aaron Sapiro, member of the executive committee, National Council of Farmers' Cooperative Marketing Associations.

Mr. Bradford B. Smith, has resigned his position as Economic Analyst, Bureau of Agricultural Economics, Washington, D. C., and is now with the White Motor Co., Cleveland, Ohio.

Dr. A. B. Cox, Agricultural Economist, Bureau of Agricultural Economics, returned early in October from Europe, where he was studying cotton marketing. Since January 1, 1926, he has been engaged at the University of Texas as head of the Department of Business Administration.

Mordecai Ezekiel has been granted leave of absence from the Bureau of Agricultural Economics to attend the University of Minnesota from March 15 to June 15. While at Minnesota he will take further graduate work in agricultural economics and economic theory and will give the course in the analysis of prices and price forecasting formerly given by Dr. Holbrook Working. Mr. Ezekiel has been studying at the Robert Brookings Graduate School of Economics and Government at Washington and expects to receive his doctor's degree during 1926.

L. A. Moorehouse, Colorado Agricultural College, and R. Wayne Newton, Bureau of Agricultural Economics, are leaders for their institutions in a cooperative study of the present status of farm taxation in Colorado and the total burden of farm taxes for selected years. Besides mail questionnaires to landlords and data on file at the State House the information obtainable from the various departments of the government relative to taxation in Colorado will be used.

The delegates from the United States to the biennial meeting of the General Assembly of the International Institute of Agriculture at Rome have been named by the Secretary of Agriculture as follows: C. J. Galpin, O. C. Stine, Asher Hobson (also permanent delegate for the United States), E. A. Foley, American Agricultural Commissioner at London; S. T. Dana, of the U. S. Forest Service; R. A. Oakley, of the Bureau of Plant Industry; L. J. Taber, Master of the National Grange; J. G. Lipman, Director of the New Jersey Agricultural Experiment Station; and Dr. R. A. Pearson, recently appointed president of the University of Maryland.

Dr. Galpin will make a five-months' study of rural social problems in central and northern Europe following the meeting of the International Institute. Besides Italy he will visit Holland, Belgium, Denmark, Finland, France, Germany, Switzerland, Czechoslovakia, Poland, Sweden, Norway, England, Ireland, and Scotland. Dr. Stine also will remain some time in Europe studying the extent of recovery from war-time conditions and the probable future trend of agricultural production, and to arrange for prompt reporting of agricultural conditions.

DOCTORAL DISSERTATIONS IN AGRICULTURAL ECONOMICS IN PROGRESS IN AMERICAN UNIVERSITIES AND COLLEGES

The name shown in parenthesis is that of the university at which the degree is sought. The date indicates the probable time of completion.

- Allen, William—B.S.A., Saskatchewan; "The Utilization of Marginal Farm Land." (Cornell, 1925.)
- Allin, B. W.—B.S., Wisconsin; "Taxation from the Standpoint of Wisconsin Farmers." (Wisconsin, 1926.)
- Alvord, Ben F.—B.S., and M.S., Illinois; "Shifts in Agricultural Production in Minnesota." (Minnesota, 1927.)
- Ballinger, Roy—M.A., Minnesota; "Agricultural Taxation in Minnesota." (Minnesota, 1928.)
- Bearson, J. B.—A.M., Stanford; "Evidences of Decentralization in Livestock Marketing." (Chicago, 1926.)
- Bray, Charles I.—B.S., Ontario A. C.; M.S., Mississippi A. and M.; "The Financing of the Western Range Cattle Industry." (Illinois, 1926.)
- Cairns, Andrew—B.S., Alberta; "A Study of Wheat Pools in the United States and Canada." (Minnesota, 1927.)

- Call, I. J.—B.S., Cornell; "Farm Taxation in New York." (Cornell, 1927.)
- Corbett, R. B.—B.S., M.S., Cornell; "Some Economic Factors Concerned in the Marketing of Fruit." (Cornell, 1925.)
- Cutler, G. H.—B.S., Guelph; M.S., Wisconsin; "Canada's Foreign Trade in Agricultural Products." (Wisconsin, 1926.)
- Davidson, C. B.—M.A., Saskatchewan; "Cooperative Selling Agencies in the Chicago Terminal Grain Market." (Chicago, 1927.)
- Dummeier, E. F.—A.M., Colorado; "The Marketing of Pacific Coast Fruits in Chicago." (Chicago, 1926.)
- Ellsworth, J. O.—A.B., Utah; M.S., Cornell; "Marketing of Sugar." (Cornell, 1926.)
- Ellsworth, Von T.—"The Distribution of Control and of Functions Between the Various Groups Making up the Cooperative Marketing Organization." (California, 1927.)
- Engle, Robert H.—B.S., Illinois; "Wastes and Losses in the Marketing of Live-stock." (Chicago, 1927.)
- Engberg, Russell C.—B.S., Iowa State College; M.S., Minnesota; "Agricultural and Industrial Influences in the Cotton Industry." (Columbia, 1927.)
- Gile, B. M.—B.S., Wisconsin; M.A., Minnesota; "The Rural Credit Situation in Minnesota." (Minnesota, 1927.)
- Graue, Erwin—B.S., Cornell; "The Development of Manufacturing Industries in Relation to the Relative Increased Demand for Agricultural Products and the Elasticity of that Demand." (Cornell, 1927.)
- Hall, I. F.—B.S., Cornell; "An Economic Study of Farm Buildings." (Cornell, 1926.)
- Hammar, Conrad H.—B.S., Minnesota; "An Evaluation of the Cut-Over Lands of the Lake States." (Minnesota, 1927.)
- Harper, F. H.—"Forecasting the Acreage, Yield and Price of Cotton." (North Carolina, 1927.)
- Harriott, J. F.—B.S., Cornell; M.S., Iowa State College; "Land Tenure in New York." (Cornell, 1926.)
- Hartman, S. C.—"Study of the Development and Present Status of the Trucking Business in Muskingum Valley, Ohio." (Ohio State, 1927.)
- Hartman, William A.—B.S., Wisconsin; "'Grub Stake' State in Colonization and 'Shot Gun' Types of Land Settlement in Northern Wisconsin." (Wisconsin, 1926.)
- Hendel, Julius—B.S., Cornell; "Relation Between Cash and Future Prices of Grain." (Minnesota, 1926.)
- Hill, F. F.—B.S.A., Saskatchewan; "Wool Marketing in New York State." (Cornell, 1926.)
- Hinrichs, A. F.—B.S., Minnesota; "Comparative Studies in German and American Agriculture." (Minnesota, 1927.)
- Holt, B. A.—B.S., M.A., Minnesota; "Potato Marketing Differentials." (Minnesota, 1926.)
- Johnson, Abner L.—B.S., Hamline; M.S., Minnesota; "Incidence of Marketing Costs." (Minnesota, 1927.)
- Johnson, O. R.—B.S., Missouri; "The Incidence of Costs as Determining the Equitableness of Rent Agreements." (Cornell, 1927.)
- Journey, R. C.—A.M., Missouri; "The Cold Storage Industry as a Factor in Terminal Marketing at Chicago." (Chicago, 1926.)
- Landon, Charles Earl—A. B., A.M., Kansas; "The World Cotton Situation." (Illinois, 1926.)
- Lattimer, J. E.—B.S.A., Toronto; "Land Tenure in Canada." (Wisconsin, 1926.)
- Lindsey, Adrian H.—"Causes of the Growth of Land Value in Iowa." (Iowa State College, 1927.)
- Metzger, Hutzel—M.S., North Dakota, A. C.; "Economic Aspects of Country Elevator Organization." (Minnesota, 1926.)
- Myers, Lawrence—B.S., Minnesota; M.S., Iowa State College; "Economics of Spring Wheat Production in the United States." (Minnesota, 1927.)

- Mowry, J. B.—"Natural Resources and Their Conservation as a College Course of Study." (North Carolina, 1926.)
- Nicholls, W. D.—B.S., M.S., Kentucky; "A Study of the Cost of Producing Tobacco." (Cornell, 1927.)
- Perregaux, E. A.—B.S., Cornell; "Some Economic Factors in the Operation of Retail Feed Stores." (Cornell, 1926.)
- Powell, Whiton—A.B., M.S.A., Cornell; "An Economic Study of Country Banking." (Cornell, 1927.)
- Rozman, I. W.—B.S., Wisconsin; "A Comparative Study of Land Tenure in the United States and Foreign Countries." (Northwestern, 1927.)
- Rowe, H. B.—B.S., Iowa State College; "A Plan for Federating Farmers Elevators in the Spring Wheat Area." (Minnesota, 1928.)
- Scholl, C. A.—B.S.A., U. of Alberta; M.S., Illinois; "The Influence of Type of Organization and Plan of Operation on the Financial Policy of California Marketing Organizations." (California, 1927.)
- Shelledy, F. H.—B.S., Missouri; M.A., George Washington; "The Risk Factor in Agriculture." (Minnesota, 1927.)
- Stitts, T. G.—B.S., Cornell; "Economic Factors Affecting the Price of Butter." (Minnesota, 1927.)
- Stockwell, M. M.—A.B., Cornell; M.A., California; "Some Problems of Land Taxation." (Illinois, 1926.)
- Sturlaugson, Jonas—B.S., North Dakota A. C.; "Large Land Holdings." (Wisconsin, 1927.)
- Ten Haken, William—B.A., Hope College; M.A., Wisconsin; "A Study of Land Ownership and Tenancy in Knox County, Illinois." (Northwestern, 1927.)
- Thurston, M. F.—A.B., Cornell; "The Marketing of Hay Through Terminal and Country Markets." (Cornell, 1926.)
- Tillett, B. P.—"Marketing Leaf Tobacco in the Bright Belt." (North Carolina, 1926.)
- Tucker, C. K.—B.S., M.S.A., Cornell; "Country Milk Plants' Operating Costs." (Cornell, 1927.)
- Vaughan, L. M.—B.S., Cornell; "An Economic Study of Farm Power Machinery." (Cornell, 1927.)
- Vial, E. E.—B.S., Illinois; M.S., Cornell; "Factors Affecting the Prices of Commercial Fertilizers." (Cornell, 1926.)
- Walker, Dilworth—B.S., Brigham Young U.; M. S., Utah A. C.; "An Economic Study of New York State Peas." (Cornell, 1926.)
- Walrath, F. J.—B.S., Cornell; "A History of the Agriculture of Tompkins County, New York." (Cornell, 1926.)
- Weaver, A. J.—A.M., U. of Texas; "The Organization and Evaluation of Market News Agencies in the Grain Trade at Chicago." (Chicago, 1927.)
- Weeks, D.—"The Measurement of Economic Conditions on Irrigated Areas." (California, 1927.)
- Whang, W. P.—"Social Aspects of the County Agent Movement in the United States." (Ohio State, 1927.)
- Working, E. J.—B.S., Arizona; M.S., Iowa State College; "The Orderly Marketing of Grain." (Harvard, 1927.)
- Zimmerman, Carle C.—B.A., Missouri; M.S., North Carolina A. C.; "Farmers' Marketing Attitudes." (Minnesota, 1926.)